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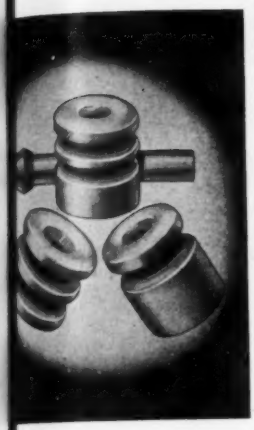

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Telephony

SEPTEMBER 25, 1937 VOLUME 113, NUMBER 13

Shortcuts in the Installation Of Central Office Equipment

By RAY BLAIN

RESULTS OF EXPERIENCE in the installation of common battery multiple switchboards, as set forth in this article of three parts, are some tried and proved shortcuts and the elimination of common mistakes of the past. This section describes clearly the steps taken in setting up a multiple switchboard and proper placing of the associated equipment

A Telephone Office Should Never Be Located on a Noisy Street Car Line if It Can Possibly Be Avoided. The Residential Sections Is Also Preferable to the Business Section of a Town.

THE INSTALLATION of a common battery, multiple type switchboard and its associated equipment is not as difficult as generally supposed. While this type equipment is ordinarily installed by the manufacturer, if a company has at least one good switchboardman in its employ there is no good reason why the installation cannot be successfully handled locally. This article will endeavor to present a general idea of the system frequently used in multiple switchboard installation with a few tried and proved shortcuts.

The selection of a suitable location for the installation of a multiple type switchboard should be carefully considered, for few of them are ever moved during their normal life. The location selected should have proper ventilation and be free from all noise and vibration which might interfere with the proper operation of the switchboard.

A telephone office should never be located on a noisy street car line if it can possibly be avoided. The residential section is also preferable to the business section of a town when this is possible. The second floor of a building is ordinarily preferable to the ground floor, as it is generally cleaner and less noisy—both are important.

The switchboard room should be of sufficient size to care for all possible future growth without crowding. Ordinarily, a clearance of not less than eight feet should be provided from the edge of the keyshelf to the wall and not less than three feet from the back edge of the switchboard to the wall. Sufficient space should be provided on the growth end of the switchboard to care for possible future additions.

Radiators should not be placed in the rear of switchboards when it can possibly be avoided, as they obstruct space and are not as effective heaters in such a position as when located in the open. Doors into switchboard rooms should be located so as to cause as little interference with operators as possible.

The proper location of windows in a switchboard room has always been a subject of dispute. Many are of the opinion that the best arrangement is to locate the switchboard with its face at right angles to the windows. The old arrangement, and one still followed to a great extent, is to install the switchboard with its back toward the greatest number of windows.

This places the face of the switchboard in the shadow and does not cause a glare on the line signals. This glare is really not of much consequence at the present time, as the improved line lamp and opal furnish a much better signal than was available in the old days. Improved scientific lighting in switchboard rooms has been of material assistance to operators in their work.

Awnings should be provided for summer use on all windows exposed to the sun. All windows should be equipped with good blinds, the venetian type being generally considered most desirable. Last, but not least, the floor should be covered with a good grade of battleship linoleum, properly laid, before the installation of the switchboard is actually started. During the progress of the installation this linoleum may be protected by rubberoid roofing or canvas.

The terminal room is usually located either adjacent to or directly below the switchboard room. A suitable cable vault for the entrance of the outside cables and for splicing the paper to the silk and cotton-insulated cable should be constructed under the main frame when the terminal room is located on the ground floor.

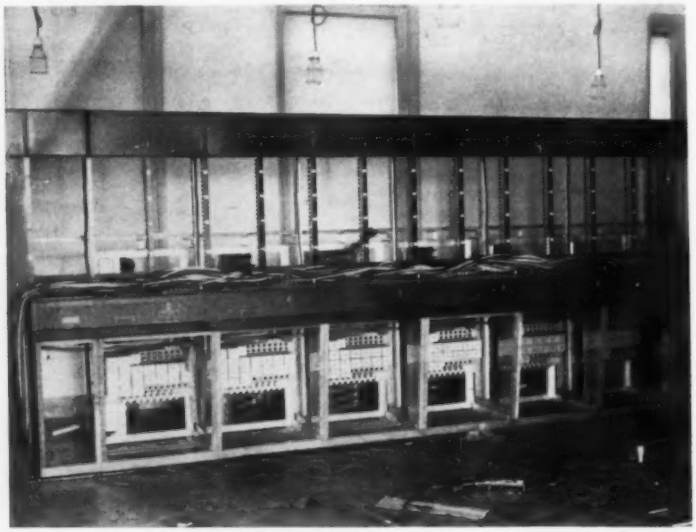
The common mistake of making the cable vault too small should be avoided if possible. The terminal room should be large enough to properly house the main frame, relay rack, power panel, charging equipment and test set without crowding. The floor of the terminal room should likewise be covered with a good grade of battleship linoleum.

Ordinarily a separate battery room is provided, although it is now common practice to install the sealed glass jar type of storage batteries on an open rack in the terminal room.

The main frame, in the author's opinion, should be located at least three feet from all walls when possible. Adequate space should be provided on the growth end to care for all possible future extensions. The frame should be located over the cable vault in such a manner as to require the least possible number of bends between the duct entrance and the protector verticals.

To best accomplish this, the main frame is generally placed in line with the ducts and lengthwise with respect to the cable vault. Holes through the floor for cable entrance to the main frame should be just back of the fanning strips and in line with, but about two inches from, the wall of the cable vault. In some exchanges where aerial cable is used, fuse type protectors are mounted on the walls and switchboard cable is used to connect them to the main frame run on an overhead cable rack.

The relay rack should be installed at least three feet from all walls, when space will permit. The plan ordinarily considered the best is to align the relay rack with the protector side of the main frame. This arrangement not only simplifies cabling but provides a very neat appearance.



The Switchboard Should Be Lined Up, All Positions Securely Fastened Together and the Unit Attached to the Floor.

Sufficient space should be provided on one end of the relay rack to care for future growth.

In some present-day exchanges the power switchboard is placed on one end of the relay rack. This makes a neat arrangement and simplifies the power wiring considerably. The mounting of ringing machines or interrupters on the power panel is now a common practice which further simplifies the installation.

The location of the wire chief's test set should receive careful consideration. Some make use of a bracket mount on the main frame, though this is not generally considered good practice. If possible, the test desk be located in such a position as to permit a man working on either the main frame or the relay rack to watch the voltmeter.

It is believed that a test set should also be installed on a desk in a special cabinet, with suitable compartments for the cable record, line cards and trouble tickets. Such a cabinet can be constructed at a very small cost and will prove a lasting convenience.

A map of the outside cable system should also be mounted in a suitable frame near the test desk.

Before starting a multiple type switchboard installation the material should all be unpacked, checked and stored in such a manner that it can not be easily damaged. Necessary precautions should also be taken to eliminate all possible fire hazards.

Suitable fire extinguishers should be provided and conveniently located. A few buckets of clean dry sand should also be kept on hand. A dry gas (carbon dioxide) fire extinguisher is ideal around an installation job, as it extinguishes fires without the possibility of serious damage to nearby delicate equipment.

The floors on which equipment is to be mounted should be as level as possible and have adequate strength to support it, with a reasonable factor of safety. The switchboard should be lined-up, all positions securely fastened together and the unit attached to the floor.

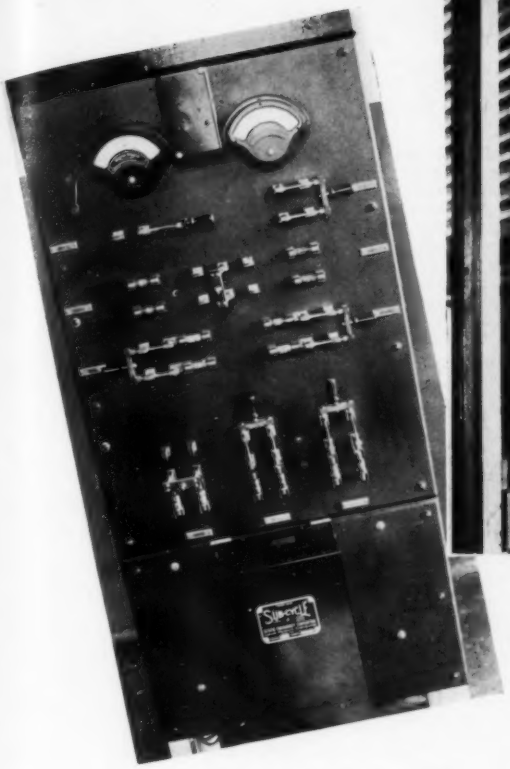
Brace the Main Frame and Relay Rack Securely

Metal angles are generally placed inside the switchboard for the floor attachment. The main frame and relay rack should be assembled, lined-up and securely fastened to the floor. This equipment should also be braced firmly to either the walls or ceiling. Angle iron is generally considered best for this purpose.

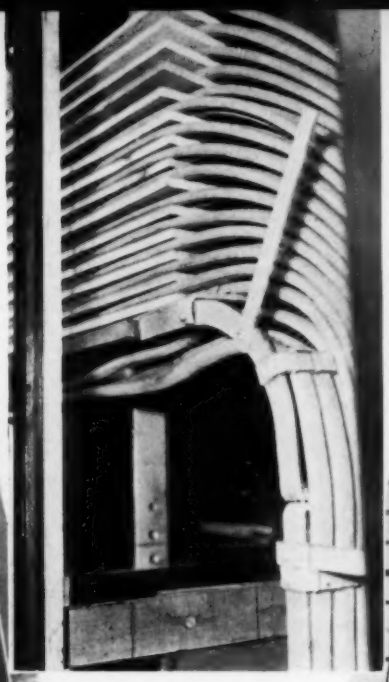
The cable racks should be installed and anchored firmly in place. Long racks should be anchored to the ceiling, in addition to being attached to the equipment at each end. If the switchboard room is above the terminal room, the cable rack should enter the cable-turning section, make the proper bend and anchor on the end of the multiple shelf.

Formerly it was considered necessary to make round turns in all cable racks; now it is common practice to make square turns in the racks and round turns in the cable. This plan seems to be just as good as the round turns in the rack and is certainly much easier.

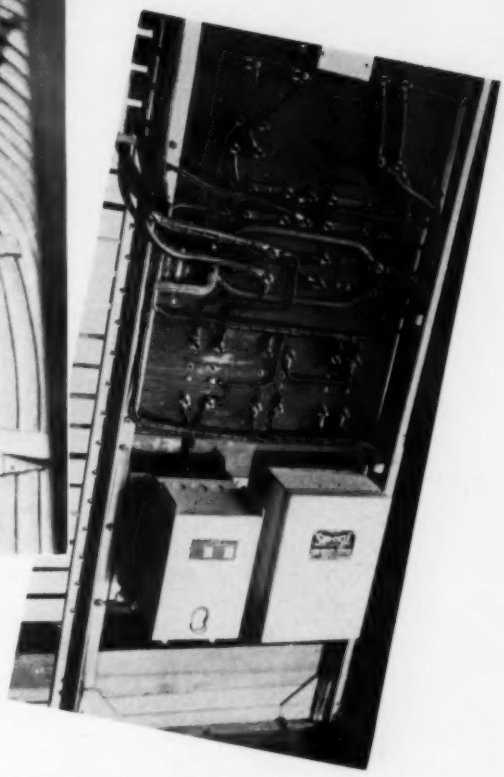
When all equipment has been mounted and cable racks put in place, the next job is to install the power wiring. It was formerly considered necessary to place this wiring all in rigid conduit; this was difficult to install and in most cases unsightly. The ringing current leads may be connected through a suitable lead-covered cable which can be conveniently laced to the under side of the cable rack.



The Mounting of Ringing Machines or Interrupters on the Power Panel Is Now a Common Practice.

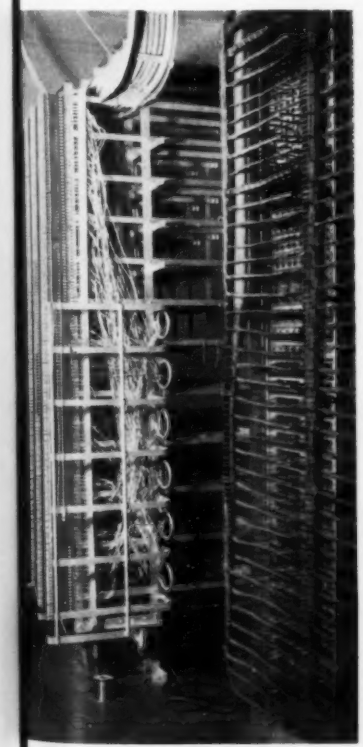


If Switchboard Room Is Above the Terminal Room, Cable Rack Should Enter the Cable Turning Section, Make a Proper Turn and Anchor on the End of the Multiple Shelf.



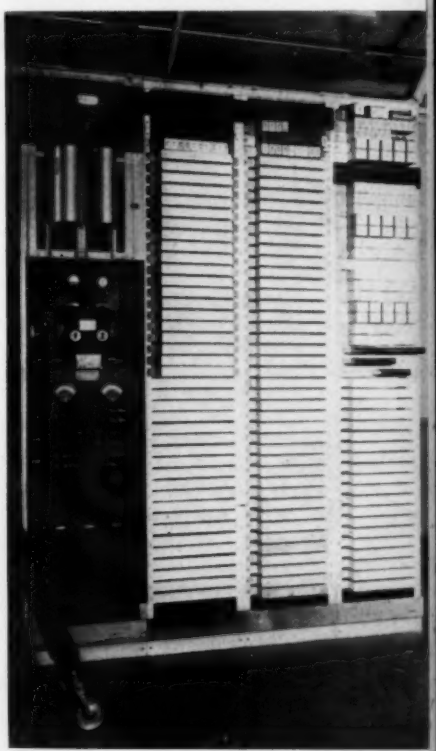
Rear View of Ringing Machine. Its Mounting on the Power Panel Simplifies the Installation.

The Plan Ordinarily Considered Best Is to Align the Relay Rack With the Protector Side of the Main Frame, as Shown Below.



The Main Frame and Relay Rack Should Be Assembled, Lined Up and Securely Fastened to the Floor. This Equipment Should Also Be Braced Firmly, Either to the Walls or the Ceiling. Angle Iron Is Generally Considered Best for This Purpose.

In Some Exchanges the Power Switchboard Is Placed on One End of the Relay Rack. This Is a Neat Arrangement and Simplifies the Power Wiring.



The battery leads should be of soft drawn copper, rubber-insulated and braid-covered. Solid wire may be used, although stranded is generally considered best. This wire may also be laced to the under side of the cable rack with the ringing current cable.

Use Over-Sized Wire for Battery Leads

The mistake should never be made of having the wire for the battery leads too small. Never be afraid of using large wire for this purpose; it is always a good idea to use wire several sizes larger than considered absolutely necessary and thus play safe.

Wire with a braid covering to match the switchboard cable may be obtained. This presents a very neat appearance when laced in the cable run. Ordinarily, the battery leads extend directly through a multiple switchboard with smaller wire used as taps off to each position. Care must be taken to solder these branch taps well where they attach the main wire.

Lugs should be sweated to the small wire for attaching to the position bus bars. Some multiple switchboards have continuous bus bars which extend through all the positions, and in this case the battery leads are attached with lugs to the main bus bars in the first position. When the power switchboard is placed at the end of the relay rack, it is a simple matter to lace the battery and ringing generator cables to an overhead rack which extends directly to it.

Ordinarily, the power leads from the power switchboard to the battery rack can best be placed in conduit under the floor. After the power leads are run, it is generally considered desirable to install all miscellaneous cables, such as outgoing trunk and cable for the test desk, before starting on the regular multiple and answering jack cables.

Coded cable should always be used in the installation of a multiple switchboard. It is a peculiar fact that many people not thoroughly familiar with the color code consider it most difficult and are afraid to attempt its use; as a matter of fact, however, it is quite simple.

Color Code Simple to Learn and Use

In the old days it was often said that an installer always repeated "blue, orange, green, brown, slate" every morning before breakfast to keep in condition, just as people now drink orange juice. If one will just keep the five master colors in mind, nothing could be any easier than using the color code. The standard color code for a 20-pair cable is:

Pair	Color	Pair	Color
1	Blue	11	Orange-white
2	Orange	12	Orange-green
3	Green	13	Orange-brown
4	Brown	14	Orange-slate
5	Slate	15	Green-white
6	Blue-white	16	Green-brown
7	Blue-orange	17	Green-slate
8	Blue-green	18	Brown-white
9	Blue-brown	19	Brown-slate
10	Blue-slate	20	Slate-white

If one will analyze this code and note the arrangement of the master colors, it will prove quite simple to remember and use. The code wires in the first 20 pairs in a coded cable are generally paired with white wires and the second 20 with red. This system may be carried on almost indefinitely, using a different colored mate for each 20-pair group. The spare pair in the first 20-group is usually white paired with red, and in the second group, white paired with black.

While the color code may be used in almost any size cable, 20-pair and 40-pair are the most commonly used in ordinary present-day switchboard installations. When 20 pairs and 20 singles are used in a coded cable, the single wires are generally of the same color as the standard code but with a few threads of white or some other color mixed with them.

This standard code is varied slightly by different manufacturers, though the base colors are always the same. The principal function of a color code is to permit the proper connection of both ends of the wires in a cable without testing.

The color code is rarely used to any great extent in trouble shooting after the equipment is once installed. Thus, as a matter of fact, it really does not matter materially which code is used if the pairs are connected in their proper sequence on each end of the cable. However, it is just as easy to connect them by the standard code as to improvise another code.

The conductors of switchboard cable are always carefully insulated. In some cables the copper conductors are first tinned and then covered with black enamel insulation. This enamel is covered with a double wrapping of silk and single cotton. In some cables just a double cotton insulation is placed over the enamel.

Switchboard cable may also be obtained with the conductors tinned and insulated with double silk and cotton but without the enamel. Switchboard cables always have an outer braid covering over the bunched insulated conductors of cotton braid impregnated with a fireproof paint.

Enamel insulation is generally considered more difficult to work with than the plain tinned conductors. When working this type wire, the silk and cotton insulation should be first removed and the enamel scraped, without damaging the tinned surface, if difficulty in soldering is to be avoided.

Some claim that they can burn the enamel off with a good hot soldering iron but it is not believed that this system will always prove satisfactory. We have found that some enamels can be burned off while others must be scraped off carefully, if a good soldering job is to be assured.

In the installation of a multiple switchboard we advocate the use of a special cable cutter for cutting the cable into suitable lengths. This tool will save its cost many times on a single job.

A regular cable stripper should be used for splitting the outer braid covering without injury to the conductor insulation, as so often happens when an ordinary knife is used for this purpose.

After the outer braid covering has been split for the proper distance, it can be cut smoothly around with a pair of good diagonal cutting pliers. The end of the braid should then be butted, or tucked under with a special butting tool. A special butting tool, with a "V" shaped point and smooth edges should always be used for this purpose to avoid possible injury to the insulation of the conductors.

Boiling Out Cable to Remove Moisture

After the outer braid covering, paper wrapping and thread binder have been removed from the switchboard cable, it should be boiled-out in beeswax heated to 375 degrees Fahr. A special wax thermometer may be purchased at a reasonable cost to accurately test the temperature.

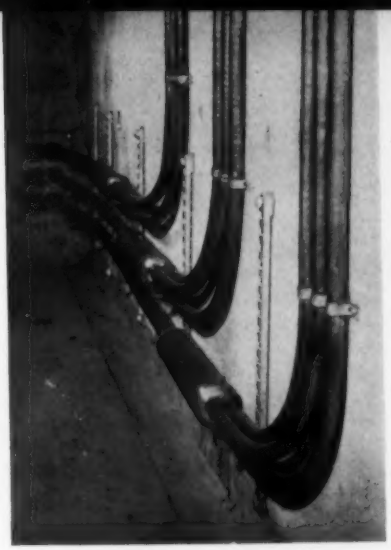
Some claim that when beeswax is heated to 375 degrees there is a possibility it will give off a vapor which may cause damage to other central office equipment in the same room. The possibility of damage from this source may be prevented by heating the wax to only 285 degrees Fahr. or placing the heating apparatus in some other room.

The process of boiling-out a cable should be continued until there is no possibility of moisture remaining in it. The bubbling and frying of a cable immersed in the hot wax will stop when all moisture has been removed.

After a cable has been boiled-out,

(*Please turn to page* 38)

Sometimes It Is Not Possible to Dip a Cable Form Into a Wax Pot, Due to Limited Space. In Such Event a Shallow Pan or Trough Can Be Used and the Wax Poured Over the Cable from the Pot or With a Dipper.

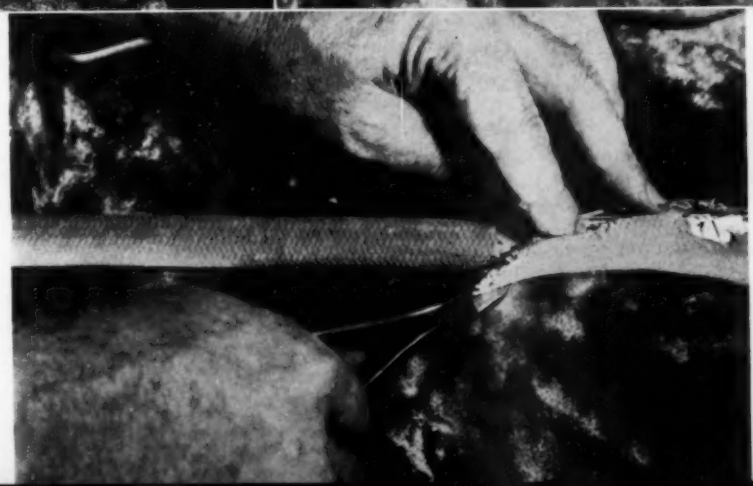


A Suitable Cable Vault for the Entrance of the Outside Cables and Splicing of the Paper to the Silk and Cotton Insulated Cable Should Be Constructed Under the Main Frame When the Terminal Room Is Located on the Ground Floor.

When Long Cables Are to Be Waxed a Metal Tube With the Bottom Closed and a Handle Attached to the Side, Not Unlike a Mammoth Tin Cup, Can Be Used to Advantage. Two Different Lengths of These Tubes, as Shown in the Accompanying Illustration, Will Be Found Convenient on a Large Job.

In the Installation of a Multiple Switchboard the Use of a Special Cable Cutter Is Advocated for Cutting the Cable Into Suitable Lengths. This Tool Will Save Its Cost Many Times on a Single Job.

The End of the Braid on the Switchboard Cable Should Be Butted or Tucked Under With This Special Butting Tool, as Shown Below.



A Regular Cable Stripper, As Shown Above, Should Be Used for Splitting the Outer Braid Covering.

After the Outer Braid Has Been Split It Can Be Cut Smooth Around With a Pair of Good Diagonal Cutting Pliers, as Shown to the Left.

IN THE NATION'S CAPITAL

By FRANCIS X. WELCH

Special Washington, D. C., Correspondent for TELEPHONY

UNION ORGANIZERS trained according to inclinations and talents for various classes of work. Methods followed by the unions in organizing industries and in organizing a telephone plant. Technique of the "social pass" employed to organize operators of one telephone company. "Wedge chapter" first formation

THE LABOR union movement seems to have reached organization proportions of planned warfare. This does not refer to the battle between the CIO and AFL especially, although that enters into the picture as a stimulant to spur competitive efforts of both groups. The warlike planning is primarily directed against the theoretical "enemy"—the employer class.

The AFL and CIO headquarters in Washington are like an army's general staff headquarters — the nerve and brain centers to which all data comes in from the field and from which all tactical orders go out to the field. The different industries are like particular battle fronts, and the different squads of organizers are classified somewhat along the lines of shock troops, advance guards, reinforcements, "mop-up" details and trouble-shooters.

THE ORGANIZERS are trained for these various duties according to their inclinations and talents. Like real military troops, some of them are better than others—which is to say they are more effective workers. There are "crack" squads, seasoned squads, and green squads.

Organizers are pretty well paid for the work they do. Salaries range from about $35 a week to as high as $200, maybe higher for some real experts. Union officials are naturally reticent about handing out such information, but they know they have to pay well for good men with smooth tongues, resourceful minds, and physical courage to cope with the problems that organizers have to meet.

Because organizers come pretty high, their number is not unlimited. Both CIO and AFL can only afford so many, and that requires careful study, planning and shifting between the different industrial fronts to get the maximum effectiveness. For an analogous example in actual military operations appearing in the daily newspapers, recall that General Franco in Spain has adopted the military strategy (probably he had no choice) of settling offensives on one sectional front at a time.

This involved the delicate problem of balancing reinforcements between the fronts so as not to draw too many men away from the non-active front to risk the danger of a defeat and at the same time concentrating enough men on the active front to keep the offensive going.

Union leaders have that very problem because they have only so many organizers available. They are busy now trying to organize dozens of different industries and literally hundreds of different plant units within those industries. The Ford Motor Co., for example, is a hard nut for CIO to crack, and Lewis knows it. And he hasn't completed his organization in General Motors by any means.

Rather than risk a setback from the foothold positions already gained in General Motors, Lewis is, at present, content with scouting and vanguard work in the Ford plant. After he feels he has cleaned up in General Motors (if he does clean up), CIO will really go to work on Ford, throwing all their best men into the "battle." At least, that's what CIO men say here in Washington. It sounds plausible.

NOW, IF THIS seems a bit removed from the telephone industry, stop and think whether you have been hearing very much about unionization in the telephone industry of late. At any rate, you haven't been hearing as much as you did about six months ago. What is the reason? Have the union leaders stalled or weakened in their drive?

Both union camps here in Washington deny that emphatically. Both AFL and CIO men claim they have made very satisfactory progress already in the telephone industry, but they give the impression that they are too busy with gas and electric utility workers right now to make their best efforts in the telephone field.

After they have finished their organization work in the gas and electric utilities, both AFL and CIO strategists are known to be planning to "shoot the works" in the telephone industry, the Bell and Independent companies. The delay is necessary in order to obtain the release of crack organizers now busy in other utility fields.

The AFL will probably make the shift this winter after the holidays; the CIO is likely to be delayed until next spring. Or so they say.

It is significant that both CIO and AFL thus seem to be working the same fields simultaneously. The answer to that is that neither one wants the other to get too far ahead. They are both out to sign up as many dues-paying members in as many different industries in the shortest time possible.

HOW DOES a union organizer go about organizing a telephone plant, for example? This writer had a pleasant evening with a CIO organizer last week and the latter really gave some interesting details on organization technique, although for obvious reasons he wouldn't be directly quoted.

It seems there are various "approaches" to a "cold" plant. A "cold" plant means one in which there is no union organization at all. A "company" plant is one in which there is a company controlling union. In either case, the organizers don't often know in the beginning just what they are up against in the way of cultivating employee membership.

The first step is to send "scouts" into the plant. Positions on company payrolls are actually secured for them

if possible. Otherwise, the scout operates in a tavern, pool hall, cafe, or other places where employes congregate. The scouts are supposed to size up the general employe situation.

The popular and unpopular workers, the natural leaders among them, the attitude toward superiors, the number and names of unsatisfied employes, if any, specific reasons for employe grievances (sometimes surprisingly trifling) are all carefully recorded by the scouts. They are not supposed to do any actual organizing. They are there just to observe —a spy, in other words; that is what the unions call employers' scouts who do similar observation for the management.

When the scout has completed his (or her) observation, sometimes he departs from the scene to go elsewhere, if that can be done unobtrusively. Sometimes he stays around to avoid notice of his real mission. Even after actual organization gets under way, the scout rarely takes an active part in it, although local practices may vary in this respect. The general idea is not to give the employes notice that they are being "cased." That might be a fatal slip, for no group of employes likes to feel it is being studied by observers for outside interests.

The "approach," or "first pass" as the organizer called it, differs according to the method of the head organizer who comes on the scene after a plant has been "cased." It may be very subtle if it is necessary to undermine fairly healthy and cordial employer-employe relations. Or, if the union organizers know that there is already a hot-bed of dissension among employes, a bold frontal attack may be made by calling an open meeting of a group of workers. Then the organizers just lay all the cards on the table, telling what they are there for and why the workers ought to join up.

THE AFFABLE organizer who talked to this writer, had no personal experience in organizing telephone plants. He had been occupied mostly in electrical manufacturing plants and had put in some pretty good licks for the CIO. But he knew another organizer, a friend of his, who had handled such a job and knew pretty much how it was done.

"Women," he said in substance, referring to telephone operators, "require a great deal of careful handling in the beginning. After they are once interested, they sign up much easier and faster than the men. But you have to use diplomacy. Almost always you have to use the social pass."

The "social pass," it turned out, was the use of social contacts to approach the female operators. In the particular telephone company in question, which the organizer declined to name, the social pass was first made through two organizers—a man and a woman—after the scout reports indicated that the employer-employe relations were pretty cordial and skill would be required to make headway.

As the company was taking on no additional help, it was necessary for the organizer to work from the outside. The lady organizer did this by cultivating the acquaintance of one of the more popular and aggressive young women in the telephone company's employ.

The social acquaintance was soon broadened to include the male organizer, who entered the picture as the gentleman friend of the lady organizer. Both appealed to the cultural ambitions of the lady operator by discussing arts, music, literature, etc., and making available to her a certain amount of literature of the mildly radical sort.

Nothing was said in the beginning about union. Social inequality of workers was stressed, of course, but only in the abstract. As the young operator was an ambitious, spirited girl, she naturally responded to this friendly interest by bringing into the circle a number of her friends who were fellow operators in the telephone exchange.

Here the position of the male organizer took on added importance. Because of his apparently modest affluence, he entered the little cultural circle at first as a friendly onlooker and later as actual host. The entertainment was innocent enough: hot dog roasts in the city parks; organized hikes in which the girls brought their own boy friends, and they even talked over plans to form a little social club. The girls all thought it was lovely.

But the organizer had other plans than social clubs. Within the surprisingly short period of ten weeks, according to the organizer who confided to this writer, the male organizer had gradually accumulated enough information about petty jealousies and differences in the plant to emerge into the open as a labor agitator.

ONE REALLY has to listen to these organizers talk to realize their persuasive talents. They are keen mass psychologists, trained and tested at union headquarters before they ever go out into the field. They know how to play on all the stops of human emotions: loyalty, pride, class prejudice, political, and even racial differences. The culmination of the ten weeks' efforts was the formation of a "wedge chapter"—enough signed members to start a petition on the way to Washington for a local charter.

The "wedge chapter" members are changed imperceptibly from neophytes to disciples under the skilful informal tutelage of the organizer. They are set loose in the plant to do "missionary work" among the other members; and by a combination of clique intrigues and petty snobbery, the petition in the plant in question was signed up in no time at all.

UNTIL THE PETITION is completed and the local charter issued, the organization work is usually under cover, using the effective thrill psychology of "secret affiliation," etc., on the workers. After the charter is issued the cover is off and organization work is promoted openly. The organizer knows that if employers interfere at this stage, the union can appeal to the National Labor Relations Board for protection of the organization work.

The original members are all well drilled in their "rights" under the Wagner act and state labor relations acts. They know they are entitled to protection from "discrimination" by employers and are instructed how to take full advantage of it. After the organization work is in the open, the next move is up to the employer. He can take it or fight it. At this point headquarters usually sends in reinforcements. They finance local headquarters and clubs, sending different organizers and orators to give the work a variety of emotional appeal.

If a strike is called, the plans call for "flying wedge" pickets from other industries already organized by the union to join the strikers for moral support. The original organizers have by this time moved on to other fields. The work is taken over by union "mop up" men, who perfect the details of dues collection, assessments, and keep the drive going full blast.

It's an interesting phenomenon, this warlike strategy of industrial labor organization. And please understand that this article is written without intent to help or discourage the progress of unionization—with no comment or conclusion on the merits or demerits of the union move-

(*Please turn to page* 29)

Mathematics for Telephone Engineers

ARTICLE EIGHT, SECTION III, of this mathematics series, which was especially written to aid telephone engineers in handling alternating current problems, continues the discussion of vectors. This series has been running in TELEPHONY since May 30, 1936

By H. H. HARRISON

LOCUS OF A VECTOR (THE STRAIGHT LINE): Let A, Fig. 142-A, be a constant vector to which is to be added a second vector, B, constant in direction but variable in length, being multiplied by a numerical quantity or *parameter* p which passes through O to $\pm\infty$.

The diagram (Fig. 142-A) shows the value of $V = A + pB$ between the values of $p = -2$ and $+4$. This is the straight line XX.

Fig. 142-B shows a somewhat different arrangement of the two vectors. In both cases a line from the origin O to the graduated straight line XX gives the value of V for the corresponding value of p.

If $p = O$ (Fig. 143-A), $V = A$ and passes through the origin O. If $A = O$ (Fig. 143-B) $V = pB$ and passes through the origin for $p = O$.

In Fig. 144-A $V = \pm A \pm pB$ and the locus of V is along a straight line parallel to the x axis. If $V = \pm A \pm jpB$, then the locus of V is along the imaginary axis. If the parameter is a function of P, say 1/p, then the locus of V (Fig. 145) is a straight line as before but the graduations are no longer equally spaced.

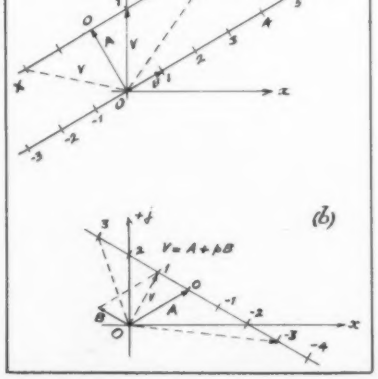


Fig. 142. Showing Two Cases of the Locus of a Vector Along a Straight Line.

LOCUS OF A VECTOR (THE CIRCLE): If two variable lines, AC and BC (Fig. 146-A), pass through the two fixed points, A and B, and are at right angles to one another, the locus of their junction is a semi-circle. The proof of this is quite simple.

Since $\alpha = 90°$, therefore $\beta + c = 90°$.

But $\triangle$ BOC is similar to $\triangle$ AOC; therefore angles α, β, and c are equal to one another and the peripheral angle $\beta + c$ is thus 90°. This proof holds wherever point C occurs on the semi-circle.

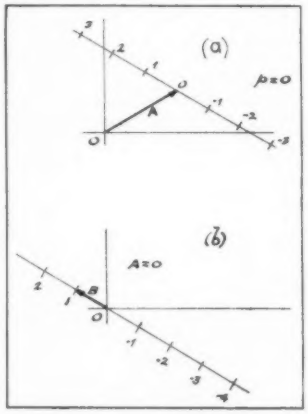


Fig. 143. Locus of a Vector $v = A + pB$ Along a Straight Line. (a) $p = 0$, (b) $A = 0$.

In Fig. 146-B Z represents a constant impedance made up of resistance R and reactance wL. If either w or L is varied, R must be altered to keep Z constant. Thus as wL is increased, R is reduced and the locus of wL and R, which are at right angles to one another, is the semi-circle described on Z.

Following are a few useful theorems:

1. The geometrical locus of all points situated a distance r from a fixed point O is a circle, Fig. 147-A.

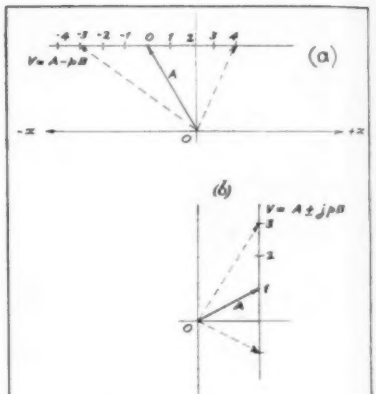


Fig. 144. (a) Locus of Vector $V = \pm A \pm pB$; (b) Locus of Vector $V = \pm A \pm jpB$.

2. A vector $Re^{j\theta} = R\angle\theta$, has as its locus ($\theta$ being the parameter), a circle; and if to such a vector a constant vector $a\ \angle\phi$ is added, the resultant R_1 will be $R_1 = Re^{j\phi}$ which is shown in the left-hand diagram, Fig. 147-B, for three values of $Re^{j\theta}$. The result, seen in the right-hand diagram of Fig. 147-B is a circle identical with the first but shifted in the direction and by the amount a with reference to the x axis.

3. Multiply $re^{j\theta}$ by $1e^{j\phi}$. This is $re^{j(\theta+\phi)}$. Then, Fig. 148-A, as ϕ varies the circle remains the same as before

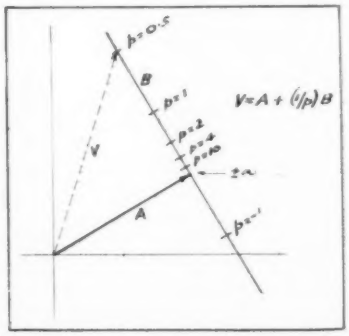


Fig. 145. Case Where Parameter Is a Function of P, (1/p).

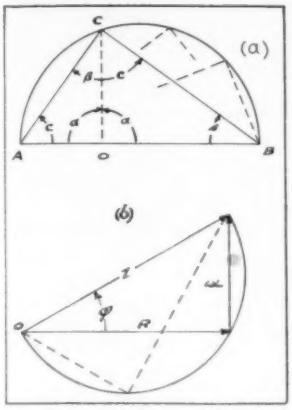


Fig. 145. The Circle as Locus of Two Vectors at Right Angles to Each Other.

but has been rotated through an angle ϕ. Point x is shifted to x_1.

4. $re^{j\theta} \times be^{j\phi}$ (Fig. 148-B). If r is drawn for $\theta = O$, then $R_1 = r \times be^{j\phi}$. $R_1 = r \times b$ rotated through angle ϕ.

5. A general expression for the circle is $R = A + re^{j\theta}$ where A is a complex number. If this expression is multiplied by $Be^{j\phi}$ then

$$[Ae^{j\alpha} + re^{j\theta}] \times Be^{j\phi} = A \times Be^{j(\alpha+\phi)} + Br.e^{j(\theta+\phi)}$$
$$= C + r'e^{j(\theta+\phi)}.$$

r has been moved through an angle ϕ and then rotated about its center through angle ϕ. Its new radius $r' = r \times B$ and its new distance from the origin $A \times B$ (Fig. 149).

6. Reciprocal of a circle.

Let $Z = re^{j\theta}$ about the origin O (Fig. 150-A) then $1/Z = 1/r\,e^{j\theta} = (1/r)e^{-j\theta}$. The reciprocal is, therefore, another circle having a radius (1/r) and a negative angle identical with the original angle. With r greater than unity (Fig. 150-B), r' will be less than r. If r is unity, the circle A is its own reciprocal, corresponding points being separated by the angle 2θ.

In Fig. 150 the circles are said to be inverse to each other. If the center of the circle does not coincide with the origin of the co-ordinate axes, its inversion still results in another circle, Fig. 151. Let $Z = ae^{j\theta} + re^{j\phi}$, then $G = 1/Z = a'e^{-j\theta} + r'e^{j\phi}$.

The distance of the center of Z from the origin O is the mean of the sum

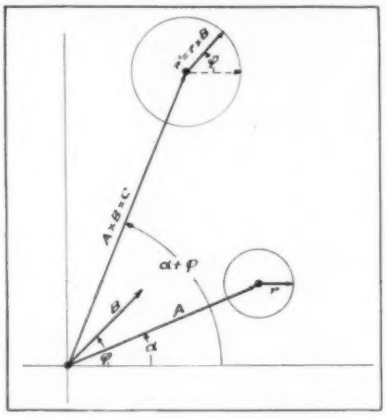


Fig. 149. Illustration of the General Expression for a Circle.

of $(a + r)$ and $(a - r)$. The inverse of this will give the distance of the center of 1/Z from the origin. Thus: $1/2 \times [1/(a + r) + 1/(a - r)] = a/a^2 - r^2$.

The radius of Z is the mean difference of $(a + r)$ and $(a - r)$. Its inverse is $\frac{1}{2} \times [1/(a + r) - 1/(a - r)] = r/(a^2 - r^2)$.

Fig. 151-B shows the case where $\theta = O$.

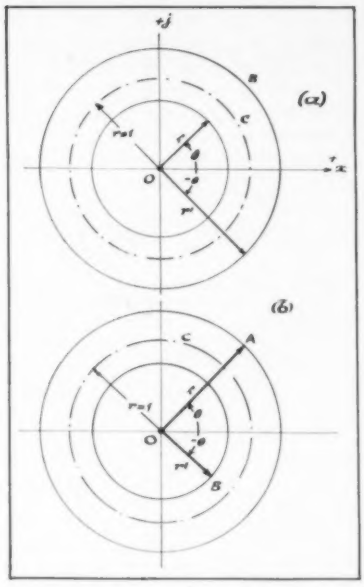


Fig. 150. The Reciprocal of a Circle.

INVERSION: If a circle passes through the origin and lies on the x axis, its reciprocal will be a straight line. Referring to Fig. 152, $OA_1 \times OA$ is constant wherever A is chosen on the straight line BC. Therefore, OA_1 and OA are inverse to each other. The reciprocal of circle OC_1B_1 is a straight line, i. e., a circle with infinite radius.

In the case shown, $0.8 \times 1.25 = 1$; and this must be so, for $A \times (1/A) = 1$. 1 is called the *constant of inversion* and O is the *inversion center*. A and A_1 are termed the *corresponding points*.

Since $\triangle$ OA_1B_1 is similar to $\triangle$ OBA, $OA_1/OB_1 = OB/OA$. Hence for any line OA, $OA_1 \times OA = OBI \times OB = 1$. Therefore, a circle passing through the

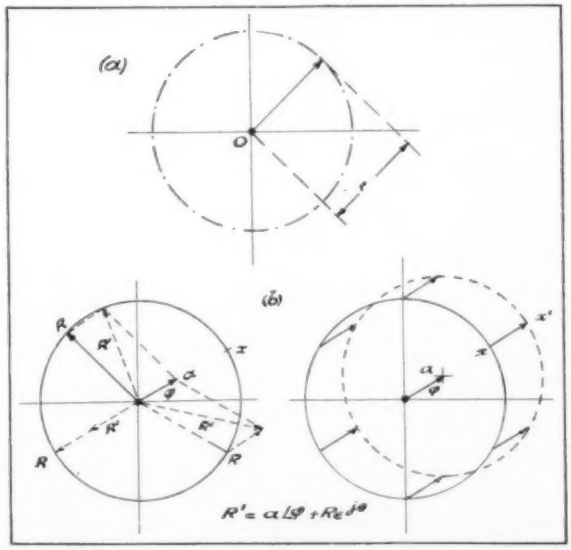


Fig. 147. Illustrating Theorems Relative to the Circle.

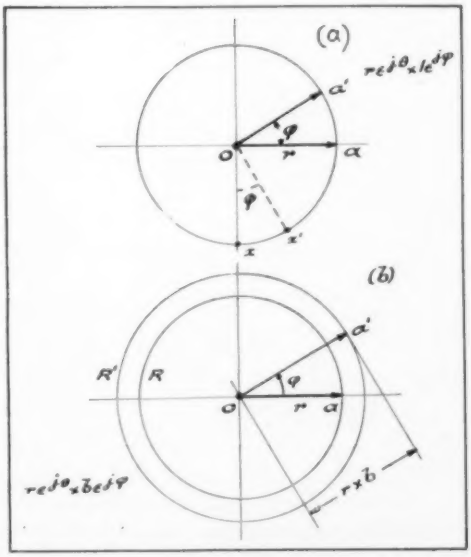


Fig. 143. Multiplication of Circular Locii.

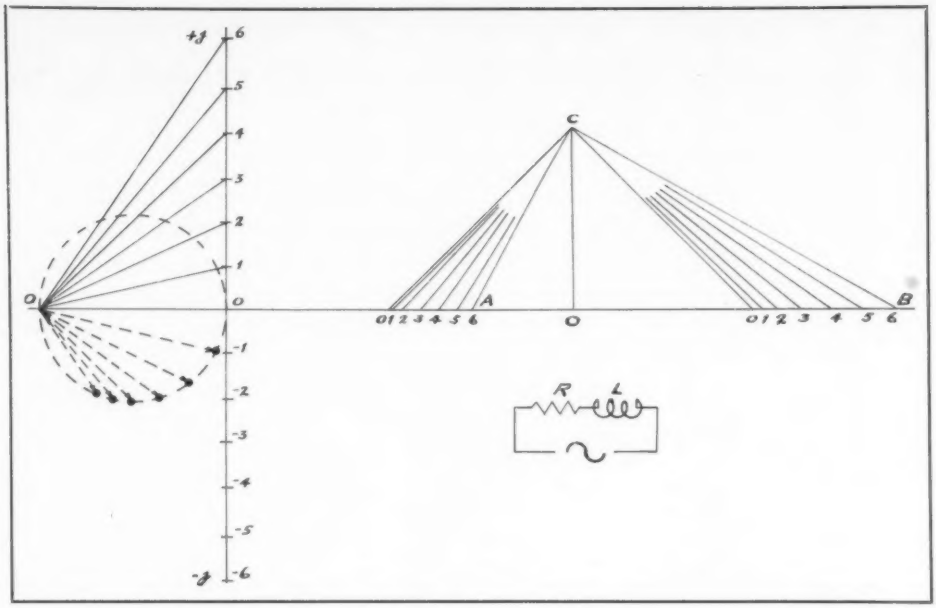


Fig. 153. Graphical Proof that the Inversion of a Straight Line Is a Circle and Vice Versa.

center of inversion is the inverse locus of a straight line. Conversely the inverse locus of a circle passing through the center of inversion is a straight line. Both statements are graphically proved by the construction shown in Fig. 153. If $G = 1/Z$, then $G/1 = 1/Z$. Take a straight horizontal line A-B (Fig. 153) and at point O erect a vertical line representing unity on the scale of the diagram. At C draw lines AC and BC such that $\angle ACB = 90°$. Then, $OA/OC = OC/OB$ or $OA.OB = OC^2 = \text{constant} = 1$.

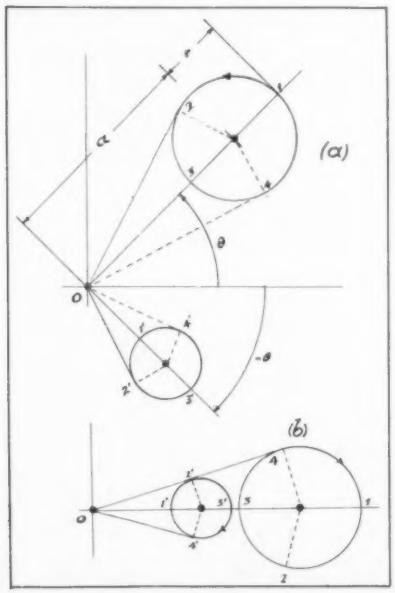


Fig. 151. Reciprocal of a Circle Not Passing Through the Origin of the Co-ordinate Axes.

Therefore, $OA = OC^2/OB = 1/OB$.

Values of OA corresponding to 1/OB are marked by corresponding numbers. To the left of the diagram, values $\pm$ OB are marked on the $\pm$ j axis and radii drawn from a point O to meet these. The corresponding values of OA are marked off on these radii and the path of the extremities of the lines representing OA is seen to be a circle.

If Z is an impedance $R + jwL$ and w or L is variable, then OO in the left-hand diagram represents R to some scale and $\pm$ jy the variable reactance. Any one of the radii in that part of the diagram represents the impedance Z and the angle θ which the radius makes with the horizontal is the angle of lag. $OO = R$ the real or A component and j (1, 2 ..... 6) the reactive or imaginary component jpB.

The conductance of the resistance and reactance will be given by the radii from O to the lower half of the circle. The upper half does not apply, since we should have to assume a negative reactance.

If the voltage applied to the combination is constant, then that part of the radius intercepted by the circle represents the current both in magnitude and in phase, since $V.G = V/R = I$ and as V is constant I varies as 1/R.

The combination of resistance and capacity in series, with w variable, can be dealt with graphically in the same way, Fig. 154. The radii from O to the j axis represent the impedances of the combination at the frequencies whose ratios to each other are as 1, 2, 4, 8, and 16. The curve connecting the impedance of the condenser with frequency is $y = 1/wK$ and is a rectangular hyperbola as it evidently must be. The radii also determine the angle of the impedance $R + j/wK = A + jpB$ for varying value of 1/wK.

If the portions of the rays intercepted by the circle are projected in the upper half circle, they represent the conductivity of the combination and, with constant voltage, the current also in magnitude and phase.

That the inversion of a straight line becomes a circle and vice versa can be shown mechanically by means of the Peaucellier linkage, Fig. 155.

Four equal links AC, AD, BC, and BD are hinged together and connected by two links OA and OB to a point O around which the whole linkage can turn. C and D are provided with tracing points. If D is moved up and down a vertical straight line, the point C will trace out a circle as the diagram clearly indicates.

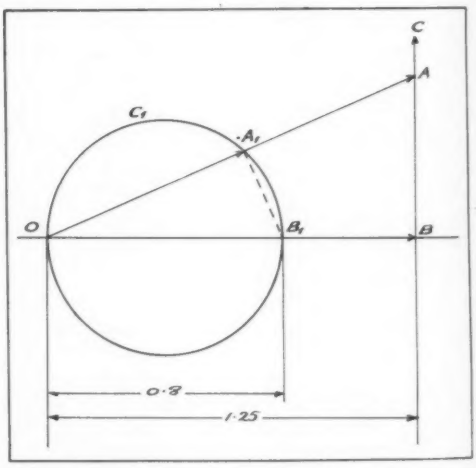


Fig. 152. Inversion of a Circle Passing Through the Origin and Lying on the x Axis.

ALTERNATIVE METHODS OF INVERSION: Fig. 156 is one method of obtaining the inverse of a vector. Draw R^x equal to R at angle $-\phi$ to the x axis. From R^x draw tangents TT to the circle. Where these touch the circle, draw a line joining them which will be at right angles to OR^x. The inter-

(*Continued on page* 23)

(*Continued from page* 18)

section of this line OR^x gives 1/R the inverse of R.

Proof: From similar triangles $(1/R)/r = r/R$ or $(1/R) : 1 : : 1 : R$ Therefore, $I/R \times R = 1$.

Fig. 156-B is the curve $1/R \times R =$ constant, the curve being a rectangular hyperbola. This requires no proof.

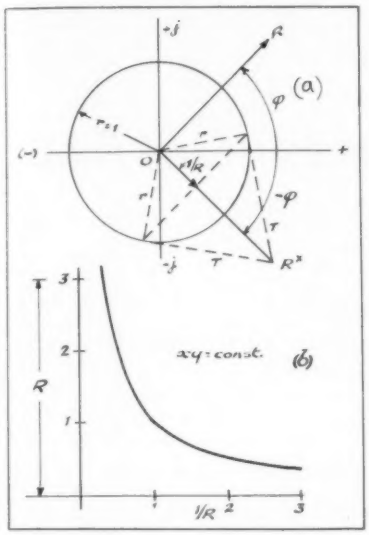


Fig. 156. Alternative Methods for Inverting a Vector.

It frequently happens that the inversion values are too small for graphical methods of treatment. This difficulty can be overcome by making the constant c^2 or some higher power. Then $R \times 1/r = c^2$ so that for a given value of R, 1/R is c^2 times greater than when $c = 1$. Thus if $c = 2$, the length of 1/R is four times greater, or the diameter of the unit circle is then 2.

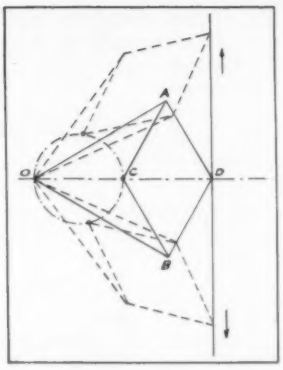


Fig. 155. Peaucellier Linkage for Drawing Inversion Curves.

Before giving further actual examples of the usefulness of the inversion process when applied to electrical circuit behavior over a band of frequencies, there are one or two simple theorems that must be borne in mind.

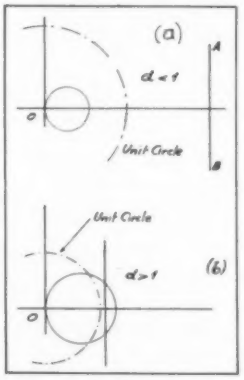


Fig. 157. Relationship of Straight Line to Circle When This Is Greater or Less Than the Unit Circle.

1. When the diameter of a circle is less than that of the unit circle, it inverts to a straight line without itself since its reciprocal is greater than 1, Fig. 157-A. When its diameter is greater than that of the unit circle, it inverts to a straight line within itself, Fig. 157-B. In this case, its reciprocal is less than 1.

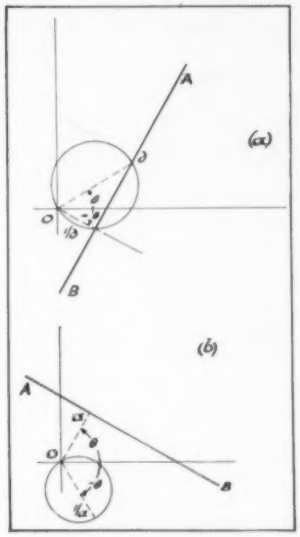


Fig. 158. Inversion of Circle Inclined to the x Axis.

2. When a circle is inclined at an angle Θ to the x axis, then 1/d and d are inverse to each other and are points on the straight line AB of which the circle is the inversion, Fig. 158-A. The inverse of the perpendicular Oa, Fig. 158-B, gives the direction and magnitude of the diameter of the circle which is the inversion of the straight line AB.

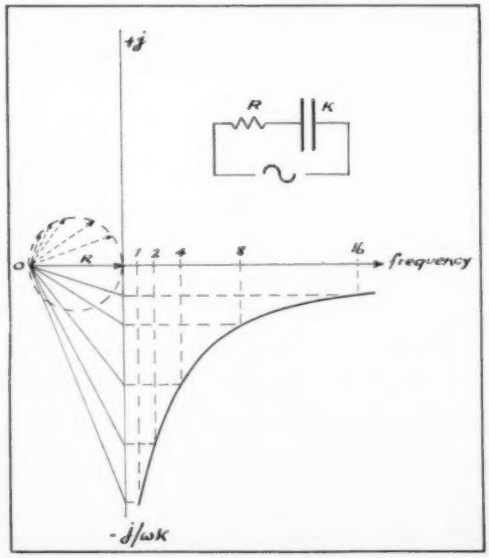


Fig. 154. Vector Diagram for Resistance and Capacity in Series With 2πn Variable.

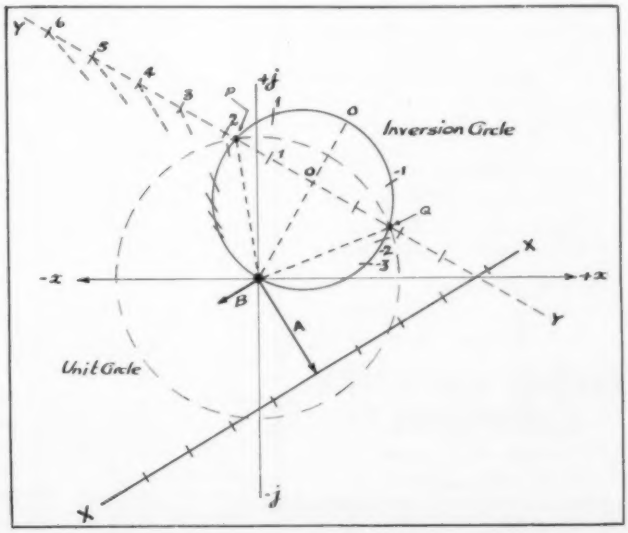


Fig. 159. Method of Graduating Inversion Circle to Correspond to the Straight Line of Which It Is the Inversion.

Fig. 159 shows a construction enabling the inversion circle to be graduated to correspond to the straight line.

Draw the "image" to the line XX which is the dotted line YY. About O describe the unit circle. This cuts the image of XX in the points P and Q which, with the point at the origin of the co-ordinate axes, enables the circle to be constructed. Lines drawn from the various points in YY cut the inversion circle at the corresponding points. *(To be continued)*

▼ ▼

Large Telephone Expansion in Manchuria

The Manchuria Telephone & Telegraph Co. spent 10,640,000 yen (approximately $5,320,000) in plant expansion during 1936, according to American Consul Wm. R. Langdon, of Mukden. This included the laying of 384 kilometers (about 240 miles) of underground cable between Mukden and Antung to connect with Chosen. This work was begun two years ago and completed last March, at a cost of 3,200,000 yen ($1,600,000).

Construction work during 1936 also included the erection of new exchange buildings in Mukden, Antung, Chinhsien and Mutanchiang. In addition, the Manchuria company loaned 1,500,000 yen ($750,000) for the establishment of a communications system in the East Topei autonomous state and installed five new broadcasting stations, and installed wireless telephone service between Dairen and Japan. During 1936 the company acquired 12 additional local telephone companies.

The Manchuria Telephone & Telegraph Co. is the 50,000,000-yen concern owned jointly by the Japanese and "Manchukup" governments, which has a virtual monopoly of electrical communications in Manchuria. On March 29 of this year it declared a 6 per cent dividend for operations during 1936. Net profits for that year amounted to 3,530,000 yen, a return of 14.7 per cent upon the paid-in capital.

The principal source of revenue was telephone service, subscribers numbering 63,374 at the close of 1936, an increase of 9,261 over the preceding year.

WE WANT TO BUY

Used telephone instruments of Automatic Electric, American Electric and Monarch manufacture. Until further notice we will purchase any quantity of the above makes of telephones in reasonable condition of repair at the following prices:

Desk Stands (without bell boxes) $1.00 Each

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Wall Telephones ..... $1.50 Each

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Associated with

Automatic Electric Company

The Operators' Corner

By MRS. MAYME WORKMAN

Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

TIME is the most valuable asset of all human possessions. Are you wasting yours? No. 303

TIME IS an important factor in the life of every individual. We enter this life at a certain time and make our exit in the same manner. Our entire life is governed by time. Time for work and time for play, time to sleep and time to eat, this constitutes the average person's 24-hour day.

Everything hinges upon time not only in the life of the individual but in the business organization as well—appointments, business conferences, parties, school and office hours, reduced telephone rates, all are based upon time. Since time controls the lives of individuals, business organizations and the entire universe, it is natural to hear this frequent query, *"What is the time?"*

In many of the small telephone exchanges it is customary to give the time of day upon request as a part of the customer's regular telephone service without making an additional charge. In the larger cities, Chicago, for example, a special operator is provided to give the time of day and customers pay for a call to get this information.

When a Chicago subscriber wishes to know the time he calls "Cathedral 8000." A green light flashes before the operator at the "phone mike" every 15 seconds which tells the operator when to begin speaking. Duplicate signals are provided in case one should fail. When the green signal appears the operator says "At the next tone signal the time will be (time)."

The operator at this position works for a period of 30 minutes and repeats the same phrase 120 times. At the end of 30 minutes she is relieved by another operator and assigned to other duties. When customers call the operator knows nothing about it. She receives the "tone" signal only, telling her she is "on schedule" while the callers are plugged in. She does not hear the courteous "Thank you's" expressed by the customers.

The "Cathedral" operator can give the time to 80 customers simultaneously. It has been stated that as many as 25,000 calls are received for "Cathedral 8000" on a holiday.

The great and good men—the big men in business and in the professions—all have employed every available moment of time. We know that time is the *only* thing we have to work with and still we frequently go on spending it like an intoxicated sailor. Some say "Time goes on." On the contrary, "Time" stays and *we* "go on."

Questions from Illinois Operators

1. How long should we wait for time and charges?
2. Should a subscriber on a party line be disconnected at the end of the five-minute period?
3. In smaller offices where operators are advised to charge non-subscribers when they use a friend's telephone and the subscriber feels that he pays for the telephone and his friends should be allowed to use it if they wish, what procedure should be taken by the operator?
4. Why is the clearing of a circuit of such importance?
5. Is it a better method for a local operator to connect subscriber to number when calling a familiar number or refer to Information?

The answers to these traffic questions are presented on page 35.

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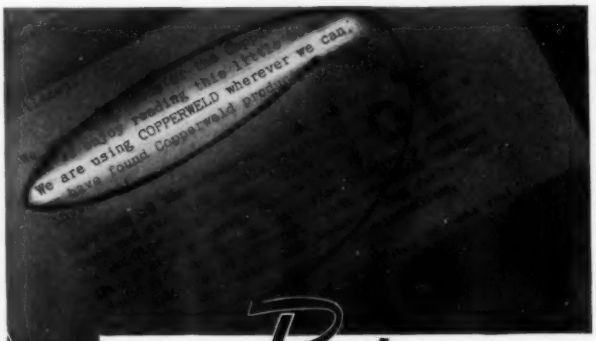

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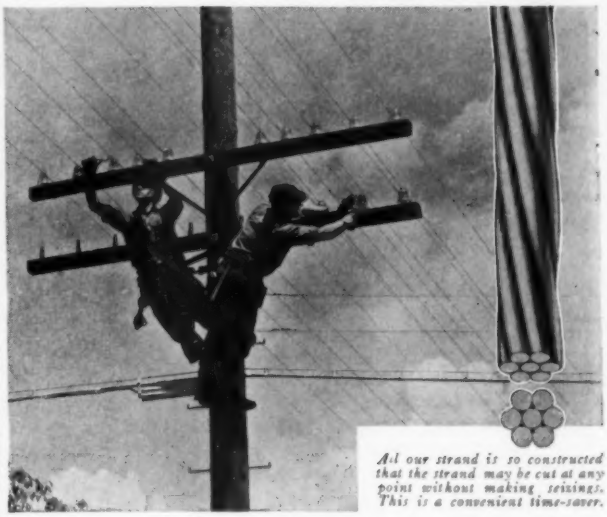

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UNITED STATES STEEL

HELPFUL SERVICE SLANTS

INJECTION of humanized and personalized service is the aim in most telephone exchanges today. Unusual requests are complied with, whenever possible, and occasional deviation made from standard phrases. Service survey is a builder of good will. Paper presented at annual operators' traffic conference of the Iowa Independent Telephone Association

By DELLA ASSORSON
Iowa Union Telephone Co., St. Ansgar, Iowa

AMONG our new services, I have been particularly interested recently in the service survey which consists of a different type of telephone checking than the old idea of giving service only when it has been requested by the subscriber. I believe that one of the most important phases of the service survey is the building up of goodwill for the company.

We approach the subscriber in an attitude of completely helpful friendliness. We ask him about the service he receives and examine his telephone, tightening the receiver caps, making note if the receiver cord is frayed or the mouthpiece broken, for a follow-up by the service man. We also check the answering time of the operator. This gives us time to gather much real knowledge of the subscriber's problems, or little irritations.

Frequently, information to us is prefaced by the remark: "We hated to mention this but ———." By the time we leave, we have had an excellent opportunity to win another enthusiastic convert for the company.

My slant on this service is that our company wants its patrons so well satisfied that they praise us rather than criticize us unfavorably to new prospects.

When calling a subscriber, we take advantage of the opportunity to mention the new low rates on long-distance calls, and the Sunday and holiday reductions. It isn't a new slant, but it is always a useful one, to attempt constantly to increase our business by leading customers to the long-distance telephone habit. In fact, we can well follow the system used by the proverbial barber who never fails to suggest to his customer an additional tonic, facial, oil treatment or what-not.

Another service new in our section which should give both the patron and the office a better slant on long distance is the CLR, where the customer is enabled mentally to go on the entire trip along with his call. The customer should be pleased with the quick, more efficient service and certainly our offices are pleased to give our small town customers city accommodations. Then, too, the new transient service extends the helpfulness of our offices to the traveling public, so rapidly increasing in this day of trailer-car homes.

I can scarcely discuss new services without mentioning the increased courtesy which we are demanding of our employes. In contrast to the "Hellu! Hellu!" of the old "Central," as she was called, we now expect "Number, please?", in the pleasant, well-modulated voice of the operator. Some companies have organized definite courses in voice training for their operators, helpful to the girl's own personalities as well as to the ears of the subscribers.

I can recall the time when a person considered himself fairly fortunate if he were able to get a bit of extra service from "Central" without being verbally set down. But, now we are attempting personalized service in many of our offices.

This service consists in attempting to comply with unusual requests in as courteous a manner as possible, besides changing the standard phrases formerly used for replies to more personal answers wherein we call the customer by name, if we can, and give him, in every case, the benefit of any possible doubt. Even though we may know he is wrong, we can courteously conceal his error until we are able to lead him to see the point of dispute in the right way.

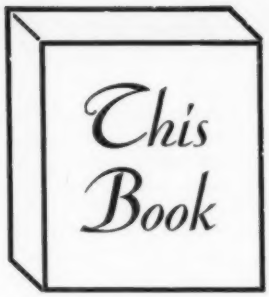
In the old days, too, a telephone office was a series of complicated mazes to the public. We do not now attempt to teach our business to our patrons, but we do believe that the more our customers know about our problems and the difficulties we encounter in furnishing that service, the more sympathetic they will be of the things that vex us and the more tolerant of the slips and lapses that must necessarily come occasionally in our operations. After all, we are engaged in serving the public.

Are we keeping up with the company? Are we able to tell our customers about new improvements? Do we appreciate the strides telephony is making constantly—the more convenient types of telephones, the new deluxe, doorless telephone booth, with sound absorbent lining, and the many new services?

The employes of the telephone company must be able to inject a bit of human service into the business of furnishing telephone connections. It is like any other business we might undertake anywhere—we get out of it only what we put into it. Are we willing to take the blame even when we know the customer is wrong?

Can we wholeheartedly give each night the prayer of the repentant "Central":

O Lord, for all I done today
To cause annoyance and delay
To make a person rant and rave,
For all wrong numbers I have gave,
And gave and gave, when I'd be cryin'
For five-three-seven, Three seven ni-yun,
For all needless irritation, when I cut off conversation
The cusses, calls for information—
Because of me—the slaps and slams
The smashed receivers—darns and damns,
I've caused this day; O, Lord, for these
And all my sins,
Excuse it, please!



"Inductive Coordination of Electric Power and Communication Circuits" by

LAURENCE J. CORBETT

Member, American Institute of Electrical Engineers, Fellow, American Association for the Advacement of Science

is the *only one* combining under one cover the essentials of this important subject involving many divisions which have been treated separately and occasionally in numerous reports and articles. It includes results of the author's researches, fitted into a broad survey of the principles applying to Inductive Coordination. It is NOT a compilation of catalog data or undigested reports. It is a carefully developed treatment and clarification of a subject which, though important, has received too little attention. Many diagrams illustrate the practical application of the principles in a manner very readily followed. The variation in values of factors is presented, and theory and practice under these conditions are carefully differentiated.

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II. Susceptiveness and Coupling Factors.
III. Effects of Conductor Arrangements.
IV. Transpositions.
V. Coordinated Transpositions.
VI. Telephone Circuits on Power Structures.
VII. Power System Wave Shape.
VIII. Trasformer Exciting Current and Bank Connections.
IX. Flow of Residual Currents.
X. Control of Residuals.
XI. Miscellaneous Values and Remedial Measures.
XII. Susceptiveness Factors.
XIII. Low-Frequency Induction.
XIV. Miscellaneous Methods.
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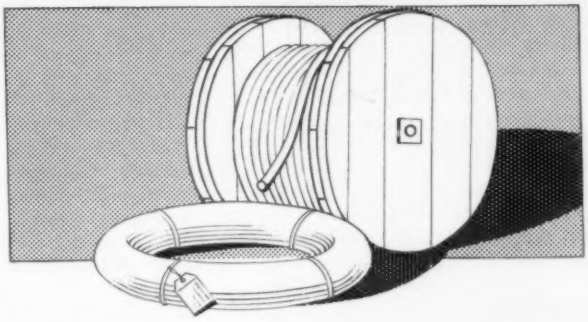

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Commission and Court Activities

Plans Expansion of Great Lakes Radiotelephone

The Lorain County Radio Corp., a subsidiary of the Lorain (Ohio) Telephone Co., has made application to the Federal Communications Commission for licenses to build two more ship-to-shore radiotelephone stations, one to be located at Port Washington, Wis., and the other near Duluth, Minn. The service is proving to be very popular on Great Lakes freighters. There are 57 ships using the ship-to-shore service at the present time, compared with six last year.

▼ ▼

FCC Orders Monthly Reports Expanded

The Federal Communications Commission on September 14 directed all telephone companies having annual operating revenues over $1,000,000 to file beginning January 1, 1938, monthly reports of selected income and balance sheet items. Only seven Independent companies will be affected by this new order.

The commission's order said that reports must be made to the commission within 40 days after the close of the calendar month covered by the reports.

Attached to the commission's order was a form to be used by the reporting companies. Besides income items similar to those reported by the railroads to the I.C.C. the actual number of originating toll calls and the estimated number of originating local calls must be reported. The report also calls for detailed information on telephone plant in service, under construction, and other data.

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McNinch to Revamp Policies of FCC

Frank R. McNinch, new chairman of the Federal Communications Commission, will devote most of his time there to "helping to formulate policies," he stated September 15 after a conference with President Roosevelt. He said that was what the President wanted him to do when he goes to the FCC.

It was reported that Mr. Roosevelt felt that the trouble in the commission, which Mr. McNinch has been deputized to straighten out, arose from its failure to lay down standards and policies, particularly in the broadcast division.

Congressional criticism directed against this division, together with charges of favoritism, inefficiency and politics in the granting of licenses and franchises led to temporary transfer of Mr. McNinch from the power commission.

The commission has been criticized on the ground that instead of establishing a policy and a set of standards at the beginning of its work, it tried to deal with each problem—applications for franchises, or other regulatory matters—as it came along.

This procedure has resulted in charges of unfairness and of general inefficiency, a situation said to have been complicated by internal dissensions between individual commissioners and individuals in the radio field.

While it was reported that Mr. McNinch hoped to start work at the FCC this week, Washington dispatches of September 17 said he had purposely delayed taking the oath of office in his new post so that the investigation of power company directorates could be put under way. In no event would he take over his new assignment prior to October 1, he said.

▼ ▼

New England T. & T. Discontinues Handset Charge

The New England Telephone & Telegraph Co. announced September 16 that its extra monthly charges for handset telephones will be discontinued on December 31, in accordance with agreements reached after conferences with public utility commissions in Maine, New Hampshire, Vermont and Massachusetts.

Chief Engineer George K. Manson of the telephone company on September 15 exhibited to members of the Massachusetts commission a new type of telephone instrument known as the combined handset and explained that the company will have a limited number available for installation next year.

COMING CONVENTIONS

South Dakota Telephone Association, Hotel Cataract, Sioux Falls, September 28 and 29.

Telegraph and Telephone Section, Association of American Railroads, The Medinah Club, Chicago, October 5, 6 and 7.

Independent Pioneer Telephone Association of the United States, Hotel Stevens, Chicago, October 14.

United States Independent Telephone Association, Hotel Stevens, Chicago, October 12, 13, 14 and 15.

Canadian Independent Telephone Association, King Edward Hotel, Toronto, Ontario, October 20 and 21.

▼ ▼

Extended-Area Service for California Districts

Extended-area telephone service in nine districts of the Los Angeles, Calif., area will be enlarged and 12 additional districts will obtain extension of toll free calling areas in accordance with a recent decision of the California Railroad Commission announced by Wallace L. Ware, president. Different dates have been set for beginning the operation of the plan in the several districts.

Under the extended-area service, subscribers may call toll-free into adjacent telephone exchange areas at a slight additional monthly cost. The decision was a natural enlargement of the plan ordered into effect by the commission in January, 1934, and is the result of several months' study by the commission's rate experts.

A loss of approximately $275,000 in the annual revenues of the Southern California Telephone Co. is estimated by the staff of experts of the commission. The Associated Telephone Co.'s revenues will be more slightly affected by the change.

The plan will go into effect on October 11 in the Roscoe district of the Burbank exchange followed by Canoga Park, Reseda and Van Nuys. On that date reductions in the rates and extension of the service will become available in Beverly Hills, Compton, Hynes, Gardena, Hawthorne, Inglewood, North Hollywood and Culver City.

The two base rate areas in the Compton-Hynes-Gardena exchange will be enlarged to give lower rates to customers previously outside the base rate area.

On November 11, the new service will be started in the cities of Arcadia, La Crescenta and El Monte. On the same date rates will be reduced and service areas extended in the cities of Burbank, Glendale, Montebello and Pasadena.

On January 1, in cooperation with the Associated Telephone Co., which serves Santa Monica and West Los Angeles, extended area service will be placed in these districts and Beverly Hills and Culver City will be provided

(*Please turn to page* 35)

IN THE NATION'S CAPITAL

(*Concluded from page* 15)

ment in general. It was just mentioned as a description of a technique which is not generally publicized. Telephone executives might be interested to know just how one campaign was put over in their own industry.

Of course, one cannot take too much for granted from the case mentioned. As the CIO man pointed out, different organizers pursue different methods according to the particular jobs they undertake. The technique would be much different, for example, in the case of male laborers, or in a plant where the CIO was competing with organization efforts from the rival AFL. In other words, it's just a casual account of one case that actually happened, revealed by a CIO organizer who happened to be visiting in Washington "waiting for further orders."

▼ ▼

National Convention Program Nearing Completion

Arrangements are nearing completion for the program of the 41st annual convention of the United States Independent Telephone Association, to be held at the Stevens Hotel, Chicago, October 12, 13, 14 and 15. An interesting, entertaining and profitable time is assured to everyone attending. Indications point to an unusually large attendance. Exhibitors are planning fine displays and a number of new firms will be represented.

The first general session of the convention will be called to order Tuesday afternoon, October 12, by President John H. Agee, Lincoln, Neb. The meeting will be given over to reports of the executive officers, appointment of committees and miscellaneous business matters and an "In Memorium" session in tribute to the late president of the association, Frederick B. MacKinnon and to two directors, Houck McHenry and H. Lester Harris, who also passed away during the past year.

Charles C. Deering, Des Moines, Iowa, secretary-treasurer, will present a report on the association's finances and membership, after which Alfred L. Geiger, Washington, D. C., the organization's general attorney, will discuss "Legal Problems of the Year."

An address by President John H. Agee on "Association Activities and Problems" will be followed by a report on "The Chicago Office," by Louis Pitcher, of Chicago, executive vice-president of the association.

At 6:30 p. m. of the opening day of the convention, October 12, state association executives will assemble for their annual conference and dinner, with President Agee of the national association presiding as chairman of the meeting. The program feature for that evening will be an address on "State Association Problems" by H. M. Stewart, of Harrisburg, executive secretary of the Pennsylvania State Telephone & Traffic Association. Everyone will be invited to participate in informal discussion of problems of mutual interest and concern.

As mentioned in TELEPHONY of last week, the morning session of Wednesday, October 13, will be given over to divisional conferences. The accounting conference will have as its chairman Ranford Dunlap, of Kansas City, Mo., auditor of the Telephone Bond & Share Co. The commercial conference will be directed by Frank T. Byrne, Rochester, N. Y., vice-president of the Rochester Telephone Corp.

Carl D. Brorein, of Tampa, Fla., vice-president and general manager of the Peninsular Telephone Corp., will serve as chairman of the plant meeting, while L. F. Shepherd, of Madison, Wis., general traffic superintendent of the central group of the General Telephone Corp., will have charge of the traffic conference.

One of the features of the general session, Wednesday afternoon, October 13, will be an address by Dr. John L. Davis, New York City, "the Will Rogers of the Pulpit" on "The Echoes of Life." Several other interesting addresses on general telephone subjects are to be made at this session, as well as the Thursday and Friday sessions.

Mention was made in last week's issue of TELEPHONY of one interesting feature of the Thursday afternoon general session, a symposium on the subject, "America — Today's Challenge: Where Are We Going in Industry and Government?" to be participated in by Dr. John A. Lapp, of Washington, D. C., and Phil Hanna, of Chicago, editor of the Chicago Journal of Commerce.

▼ ▼

Iowa Telephone Assessments Higher

A slight increase appears in 1937 assessments of telephone companies' lines, according to the list of utility assessments recently made public by the Iowa Board of Assessment & Review at Des Moines. The total for 1936 was $680,289 and that for 1937, $695,804.62. Comparative assessments with the 1936 figure given first are, American Telephone & Telegraph Co., $99,199 and $102,070.55; Northwestern Bell Telephone Co., $449,713 and $462,576.80; Central City Telephone Co., $8,262 and $8,433.50.

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The Manufacturers' Department

Automatic Electric's Changes in Executive Organization

Automatic Electric Co., Chicago, Ill., has announced the appointment of P. W. Conrad, for some years vice-president in charge of sales and promotional activities, as president of the company, succeeding the late H. L. Harris. At the same time, W. J. Caverley, recently treasurer, has been made vice-president and general manager, and J. W. Shipman, who is vice-president of Automatic's domestic and foreign sales affiliates, becomes also vice-president of the Automatic company in charge of all commercial and sales matters.

P. W. CONRAD, Automatic Electric Co.'s New President.

Mr. Conrad brings to his new position a varied experience. After active naval service in 1917 and 1918 as warrant officer and subsequently with commission as ensign, he entered Amherst College, graduating in 1923 and thereafter engaged in sales, promotional and production operations for a number of years, chiefly with firms in the East, and involving activities both in this country and abroad.

Prior to becoming associated with the Automatic organization Mr. Conrad supplemented his business experience with graduate study in public utilities and allied fields at the Harvard School of Business Administration.

Mr. Conrad entered Automatic's employ in the capacity of assistant vice-president assigned to special sales negotiations, both domestic and foreign, and was subsequently elected commercial vice-president, in which capacity he has also taken an active part in direction of the company's research and development activities.

W. J. Caverley, who becomes vice-president and general manager of Automatic Electric Co., was graduated from Loyola University in 1910. After three years of post-graduate work at Northwestern University, in which he specialized in commercial subjects, he engaged in accounting work with the Chicago & North Western Railway Co. and subsequently in the construction division of the U. S. Army. He was also associated with Arthur Andersen & Co. and with the automotive specialty field prior to his going with the Associated Telephone & Telegraph Co. as assistant treasurer.

In 1935, after serving as secretary and treasurer of the Automatic Electric Co. and of its associated sales companies, Mr. Caverley was appointed president of American Automatic Electric Sales Co. Prior to his present appointment as vice-president and general manager he held the position of treasurer of the Automatic company.

W. J. CAVERLEY, Recently-Appointed Vice-President and General Manager of Automatic Electric Co.

J. W. Shipman, a native of Texas, has both engineering and business education, having graduated from the University of Texas in 1924 with the degree of B.B.A. After some years in the foreign service of the National City Bank of New York, serving in executive capacity with various of its branches in Brazil and the Argentine and other South American countries, he entered the employ of Automatic Electric Sales Co., Ltd., becoming increasingly active in export distribution. He was appointed vice-president of that company and, subsequently, vice-president also of American Automatic Electric Sales Co., taking over supervision of both export and domestic sales.

He will retain these official positions while assuming his new duties as vice-president of the Automatic Electric Co. in charge of commercial and sales matters.

▼ ▼

Stromberg-Carlson's Catalog on Magneto Supplies

Just issued is a 62-page catalog describing Stromberg-Carlson's complete line of magneto switchboards, telephones, accessories and supplies.

All of the items illustrated and described in the new catalog, No. 37ME, are of the usual Stromberg-Carlson high quality. Operating company heads who have already received this new publication have praised it, saying it is invaluable as a guidebook.

▼ ▼

Leich's New Convertible Desk-Set Box

An entirely new desk-set box has been announced by the Leich Sales Corp. In addition to serving the usual purpose of a desk-set box it can be later converted into the base for the Leich conventional handset, forming a self-contained telephone of the most modern type.

The box is neatly designed and unusually compact, the size being 6 ins. by 4¾ ins. by 1½ ins., the height be-

J. W. SHIPMAN Is Vice-President of Automatic Electric Co. in Charge of Commercial and Sales.

ing slightly increased when an induction coil is used.

The top and bottom plates of the desk-set box are of steel, treated to prevent rusting and then given a durable black finish which, it is stated, will neither chip nor peel. The sides consist of a single piece of heavy moulded black Bakelite to match the base of the handset. The box is of the enclosed gong type with pleasing lines

New Desk Set Box Which May Also Serve as Base for Handset Instrument When Desk Set Is Discarded.

that fit perfectly with the modern base of the conventional Leich handset.

The ringer is of new and modern design, easily adjusted and equipped with deep, skirted gongs of different tones, providing a distinct and pleasing signal.

The outstanding idea in the designer's mind was to create a piece of equipment that serves its purpose today and may also be used tomorrow, fitting in with the change of trend in telephone instruments.

▼ ▼

Kellogg Masterbuilt Board in Andalusia, Ala.

On September 11 the Andalusia Telephone Co., Andalusia, Ala., cut over its service to a new five-position 12-1600 Masterbuilt switchboard furnished by Kellogg Switchboard & Supply Co., Chicago, Ill.

The new switchboard is equipped with 600 common battery local lines, 20 common battery pay-station lines, 20 lamp-signal magneto toll lines and 10 lamp-signal magneto rural lines. In addition to a new switchboard, the company installed a new relay rack, cable rack and power equipment.

The new switchboard has two local positions equipped with common battery cord circuits arranged for single-frequency, two-party divided automatic ringing. It also has two toll positions which are equipped with universal toll cords having two-party master keys; and there is one universal position equipped with single-frequency, two-party divided automatic ringing.

▼ ▼

Consulting Engineer on Communications Problems

Harold J. McCreary, formerly chief engineer of the Leich Electric Co., at Genoa, Ill., has opened a consulting engineer's office in the Bankers' Building, 105 West Adams Street, Chicago. He has had wide experience over a period of 15 years in research, development and design in telephony, radio, television, electronics, railroad signaling, electrical control systems, specifications, inspection and factory practice and patent litigation.

A native of Shelton, Neb., Mr. McCreary's boyhood was spent in Scottsbluff, Neb., which his father helped to pioneer. Young McCreary spent much time in the local exchange of the Platte Valley Telephone Corp. and was very familiar with telephone equipment and parts when he entered public school.

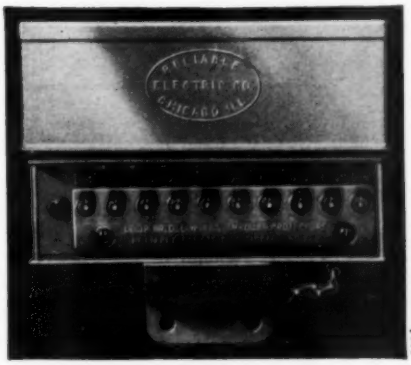
While in grade school, about 1915, he constructed his own radio receiving and transmitting set, one of the first in that section. School vacations were spent in electrical work of various

HAROLD J. McCREARY Who Enters Consulting Engineering Field in Research and Practical Problems of Communications.

kinds including telephone trouble and installation. While at the University of Nebraska, from which he was graduated in electrical engineering in 1923, he invented and patented a system of cathode ray television.

After graduation from college Mr. McCreary spent about two years with

(*Concluded on page* 35)



Reliable

No. 222

CROSSARM PROTECTOR

●

No. 222 ten-wire crossarm arrester drains static from exposed lines. It is very sensitive in operation and rugged in construction.

●

Use the No. 222 in connection with unprotected cable terminals where drops are over exposed. Use it on open wire one or two poles away from your cable end. On lines where static is very troublesome, crossarm arresters should be placed at frequent intervals.

Reliable ELECTRIC COMPANY

OVER 25 YEARS SERVICE TO THE UTILITIES

Financial Operating News and Data

Recent Prices of Telephone Securities

(These quotations as of September 17, 1937, are supplied by Telephone Securities Corp., 120 S. La Salle St., Chicago, Ill.)

TELEPHONE BONDS

	Bid	Asked
American Utilities Service Corp., 6s, 1964	70	73½
Ashland Home Telephone Co., 4½s, 1961	102¼	..
Associated Public Utilities Corp., 5s, 1947	59	64
Associated Telephone Co., Ltd., 4s, 1965	103	105
Associated Telephone & Telegraph Co., 5½s, 1955	76	80
British Columbia Telephone Co., 5s, 1960	105¼	..
California Water & Telephone Co., 5s, 1965	100½	103
Central Electric & Telephone Co., 5s, 1955	97	100
Central Iowa Telephone Co., 5½s, 1947	98½	101½
Central Telephone Co., of Delaware, 6s, 1938	12	15½
Citizens Independent Telephone Co., 5¼s, 1961	101	103
Commonwealth Telephone Co. of Pennsylvania, 5½s, 1945	87¾	90½
Commonwealth Telephone Co. of Wisconsin, 4s, 1966	97	99½
Community Telephone Co., income 5s, 1949	21	24
Cumberland Valley Telephone Co., 5s, 1966	98¾	101
Florida Telephone Corp., 6s, 1945	90	93
Florida Telephone Corp., 6s, 1954, second mortgage	63	..
Gary & Co., Theodore, 6% income notes, $6 par	2¼	3½
Home Telephone & Telegraph Co., of Fort Wayne, Ind., 6s, 1943	104½	..
Home Telephone & Telegraph Co., of Fort Wayne, Ind., 5½s, 1955	104	105½
Indiana Associated Telephone Co., 4½s, 1965	104½	106½
Indiana Central Telephone Co., 5½s, 1958	85	90
Illinois Communities Telephone Co., 6s, 1949	63	67
Illinois Commercial Telephone Co., 5s, 1948	99½	101½
Illinois Commercial Telephone Co., 5s, 1960	98	100¼
Inland Telephone Co., 6s, 1948	89	92
Interstate Telephone Co. of Idaho, 5s, 1961	99¼	101½
Interstate Telephone & Telegraph Co., 5½s, 1953	93½	95
Investors Telephone Co., 3s, 1961	49	53
Iowa-Illinois Telephone Co., 5½s, 1949	48½	52
Jamestown Telephone Corp., 5s, 1954	103½	105
Kansas Telephone Co., 6s, 1939	flat	38 ..
Keystone Telephone Co. of Philadelphia, 6s, 1951	97½	100
Keystone Telephone Co. of Philadelphia, 5½s, 1955	97	99¾
La Crosse Telephone Co., 5½s, 1948	101½	103¼
Lexington Telephone Co., 6s, 1944	100	102
Lorain Telephone Co., 5s, 1958	102	104½
Michigan Associated Telephone Co., 5s, 1961	102	104
Middle States Telephone Co. of Delaware, 6s, 1947	97¾	101¼
Middlewestern Telephone Co., 6s, 1943	70	73
Missouri Telephone Co., 4¼s, 1961	98¼	100
Ohio Associated Telephone Co., 4¼s, 1966	98½	100¼
Ohio Central Telephone Co., 6s, 1947	93½	96
Pennsylvania Telephone Corp., 4s, 1965	104½	106½
Pike County Telephone Co., of Indiana, 6s, 1946	flat	39 ..
Pike County Telephone Co., of Illinois, 6s	102	..
Platte Valley Telephone Corp., 6s, 1947	99½	101¾
San Angelo Telephone Co., 5s, 1958	102½	..
Santa Barbara Telephone Co., 3½s, 1966	98½	100¼
Southwestern Associated Telephone Co., 5s, 1961	93	96½
Southwestern States Telephone Co., 6s, 1948	61	63¾
Southwestern States Telephone Co., 6s, 1949	58	62
Standard Public Service Co., 6s, 1948	55	59
Telephone Bond & Share Co., 5s, 1958	67	71
Telephone Service Co., of Ohio, 5s, 1953	77	81½
Tri-County Telephone Co., 4½s, 1956	101	103
United Telephone Co., of Delaware, 6s, 1948	89	92
United Telephone & Telegraph Co., 5½s, 1953	99¾	102
United Telephone & Telegraph Co., 6s, 1953	100	102½
Wabash Telephone Co., 4½s, 1956	100	102½
Warren Ohio Telephone Co., 6s, 1942	97½	100
West Coast Telephone Co., 5s, 1953	94	96½
Western Light & Telephone Co., 5s, 1954	99½	102

PREFERRED STOCKS

	Bid	Asked
Associated Telephone Co., Ltd., $1.25	23	25½
Associated Telephone & Telegraph Co., 7% first	38	42
Associated Telephone & Telegraph Co., $6 first	37½	40½
Associated Telephone & Telegraph Co., $4 cumulative	8½	11½
Bell Telephone Co. of Pa., 6½% $100 par	116	119
California Water & Telephone Co., 6% $25 par	22	24¼
Central Electric & Telephone Co., $50 par	27	30
Community Telephone Co., $2 cumulative, no par	1	2½
Commonwealth Telephone Co., of Wisconsin, 6%, $100 par	89	93
Continental Telephone Co., 7% first	90	94
Continental Telephone Co., 6½% first	88	93
Diamond State Telephone Co., 6½% $100 par	111¾	114¾
Empire Telephone Co., 6% cumulative, Class "A" $25 par	15	18
Florida Telephone Corp., 6% cumulative, $100 par	39	..
Gary & Co., Theodore, first $1.60 pfd.	1½	2½
General Telephone Allied Corp., 6% convertible	94½	97
General Telephone Corp., $3 convertible	43	46½
Home Telephone & Telegraph Co., of Ft. Wayne, 7%, $50 par	49	52½
Illinois Commercial Telephone Co., $6	80	83
Interstate Telephone & Telegraph Co., first pfd., "A" 6%	58	61½
Jamestown Telephone Corp., 5% cumulative, $100 par "A"	99½	..
Jamestown Telephone Corp., participating pfd., $100 par	99½	..
Keystone Telephone Corp., $4 cumulative, no par	21½	24½
La Crosse Telephone Co., 6% prior	96½	100
Lexington Telephone Co., 6½% prior	79	83
Lincoln Telephone Co., 6% cumulative $100 par	105½	107
Lorain Telephone Co., 6% cumulative $100 par	99½	102
Middle States Telephone Co., of Illinois, 7%	94½	97
Mount Vernon Telephone Co., 6% cumulative $100 par	90	93
Northern Ohio Telephone Co., 7% cumulative	97	100
Ohio Central Telephone Co., 7% first	46	50
Ohio Service Holding Corp., $5 pfd., $5 par	43	46
Pacific Telephone & Telegraph Co., 6% $100 par	137	141
Peninsular Telephone Co., 7% cumulative "A"	110	113
Pennsylvania Telephone Corp., 6% cumulative	105¾	109½

HEMINGRAY Glass INSULATORS

For a long life of dependable low-cost service rely on Hemingray Pin-Type Glass insulators.

No aging or deterioration . . . unaffected by sudden temperature changes . . . interval strains and stresses removed . . . homogeneous in character, only one coefficient of expansion . . . sustained high dielectric strength . . . clear, flawless for easy inspection . . . all surfaces impervious to moisture . . . tougher, improved glass to withstand rough handling. Write us about your requirements. We'll gladly send samples.

Owens-Illinois Glass Company, Muncie, Indiana.

	Bid	Asked
Rochester Telephone Corp., 6½% cumulative	109½	..
The Southwest Telephone Co., 7%	1	3
Southwestern Bell Telephone Co., 7% cumulative pfd.	120	123
Telephone Bond & Share Co., 7% first	29	33½
Telephone Bond & Share Co., $3 first	20	23
Telephone Bond & Share Co., participating pfd.	10	..
Union Telephone Co., $1.70 pfd., $25 par	6	9
Warren Ohio Telephone Co., 7% $100 par	44	48
West Coast Telephone Co., 6% $25 par	20	22¾
Western Light & Telephone Co., $1.75 first, $25 par	19	22
Wisconsin Telephone Co., 7% $100 par	115½	118
COMMON STOCKS		
American Telephone & Telegraph Co.	158	162
Associated Telephone & Telegraph Co., Class "A"	5	7
Bell Telephone Co., of Canada	165	170
Central Electric & Telephone Co.	¾	1½
Empire Telephone Co.	5	7
Florida Telephone Corp.	6	11
General Telephone Corp.	14	17
Home Telephone & Telegraph Co., of Ft. Wayne, $50 par	70	75
Illinois Bell Telephone Co.	156¾	160
International Telephone & Telegraph Corp.	7½	9¼
Investors Telephone Co. $100 par	12	16
Lincoln Telephone & Telegraph Co., Class "A"	34	36¼
Middlewestern Telephone Co.	3¾	5½
Mountain States Telephone & Telegraph Co.	135	139
New England Telephone & Telegraph Co.	116½	119½
Northern Ohio Telephone Co.	69	..
Peninsular Telephone Co.	24	27¼
Telephone Bond & Share Co., Class "A"	3¼	5
Telephone Investment Corp., no par	46	49
West Light & Telephone Co.	1	1½

▼ ▼

Foreclosure Sale of Kansas Telephone Co.

The property of the Kansas Telephone Co., with headquarters in Topeka, Kans., will be sold at special master's sale at the court house in Paola, Kans., at 10 a. m. Tuesday, October 5, according to information from M. F. Cosgrove, master for the receivers of the company.

This action is in harmony with a decree made by the federal district court of Kansas, first division, on July 24 and a subsequent order issued August 20 instructing the special master with reference to the sale of the property in question in a suit entitled "Fidelity National Bank & Trust Co. of Kansas City, trustee, plaintiff, vs. Kansas Telephone Co., a corporation, defendant, in equity consolidated No. 1500-N."

The property, according to the court's decree, will first be offered for sale in parcels, each parcel consisting of such portions as, in the opinion of the special master, should be considered a parcel. The property will then be offered for sale in its entirety.

If the aggregate of the highest bids for each parcel offered for sale exceeds the highest bid for the property in its entirety, then the highest bid made for each parcel must be accepted by the special master and the several properties sold to the parties making the highest bids for each parcel.

If the highest bid for the entire property is higher than the sum of the highest bids for the parcels, then the property shall be sold to the person or persons making the highest bid for the whole property. Any action of the special master is subject to confirmation by the court.

The Kansas Telephone Co. operates in the following counties: Allen, Anderson, Butler, Cowley, Crawford, Franklin, Jackson, Leavenworth, Lyon, Marshall, Nemaha, Neosho, Sedgwick, Wyandotte, with exchanges or lines in 46 cities, towns and villages of the state.

A majority of the bondholders of the company favor reorganization of the company and the bondholders' protective committee will be a potential bidder unless a cash bid is received which is satisfactory to the committee. It is stated that 62 per cent favor reorganization and the remaining 38 per cent favor liquidation to the highest bidder. It is understood that if the receivers could obtain about $500,000 reorganization proceedings would be dropped.

The Kansas Telephone Co. has outstanding $620,500 of 6 per cent bonds, of which the bulk is held in Kansas City. The reorganization plan favorable to bondholders calls for a new 20-year first mortgage bond with coupons of 3 per cent for the first five years, 4 per cent for the next five years, and 5 per cent for the next 10 years.

▼ ▼

Western Electric Dividend; Employment Increasing

Directors of the Western Electric Co. on September 14 declared a dividend of 75 cents per share. The dividend is payable on September 30, to stock of record at the close of business on September 24, 1937.

Employment at the Western Electric Hawthorne Works has risen above the 20,000 mark for the first time since 1932, according to Chicago newspapers. On September 1, there were 20,263 workers on the payroll, representing a gain of 8,089 compared with the same date last year, and 4,962 since the beginning of the year. The handset telephone division is operating on a three-shift basis.

▼ ▼

Prices in the Metal Markets

New York, September 20.—Copper quiet, electrolytic spot and future, 14c; export, 12.95@13.06c. Tin easy, spot and nearby, 58.62½c; future, 58.12½c. Lead quiet, spot New York, 6.50@6.55c; East St. Louis, 6.35c. Zinc steady, East St. Louis spot and future, 7.25c. Iron quiet, No. 2, f.o.b. Eastern Pennsylvania, 25c; Buffalo, 24c; Alabama, 20c. Aluminum, virgin 99 per cent, 20c. antimony, spot unquoted.

COOK

DEPENDABLE TELEPHONE TERMINAL AND PROTECTION EQUIPMENT

SKILLED FINGERS

More than any other single factor, the experienced skill of Cook craftsmen is responsible for the remarkable reputation Cook equipment has won for dependable performance, long life, low maintenance cost.

Correct design resulting from tests in the Cook laboratory and in the field; selection of quality materials; precision methods of manufacture; skill born of long experience and careful training—these are the primary reasons why experienced telephone engineers specify Cook equipment. And why Cook equipment makes good.

COOK ELECTRIC CO.
2700 Southport Ave. Chicago

Always Specify COOK PROTECTION

"Telephony's" Engineering Data

By B. C. Burden

Index, General.
Sept. 25, 1937.
No. 43-A, page 86.

Theory and Practice in the Magneto Telephone Exchange—(Ctd.)

Storm Loading Areas

Inasmuch as the severity of storms varies widely in different parts of the country, pole-line design engineers have found it necessary to arbitrarily divide the United States into three areas, the areas being selected with regard to the intensity of storms normally encountered in them. They are referred to as the *light, medium* and *heavy-loading districts.* Fig. 83 illustrates a small scale map of the United States on which the areas are indicated.

It should be noted that the heavy-loading area indicates that section of the country in which the most severe storms are encountered. The medium area is less subject to storms, and the light area is that part of the country in which storms are relatively infrequent and where there are no ice conditions with which to contend.

Sleet forms a radial ice deposit on telephone wires which increases the area of the wire exposed to transverse winds, with the result that pressure on a pole is greatly increased where appreciable wind at right angles to the pole line is encountered. By definition the three loading areas are described as follows:

1. The light loading area—one having no ice deposit and a 12-pound per square foot maximum wind at a temperature of 30° Fahr.

2. The medium loading area—one having a ¼th inch

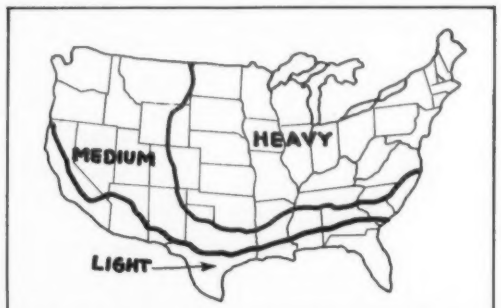


FIG. 83. STORM LOADING MAP OF UNITED STATES.

"Telephony's" Engineering Data

By B. C. Burden

Index, General.
Sept. 25, 1937.
No. 43-A, page 87.

radial ice deposit with an 8-pound per square foot wind at a temperature of 15° Fahr.

3. The heavy loading area—one having a ½-inch radial ice deposit with an 8-pound per square foot wind at a temperature of 0° Fahr.

The three loading conditions are illustrated in Fig. 84.

Naturally the engineer must use good judgment in the design of pole plant and must interpret storm-loading area

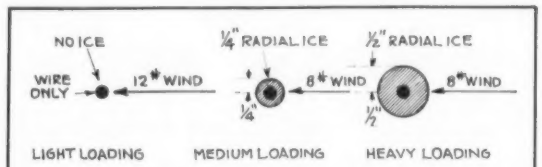


FIG. 84. ILLUSTRATION OF THREE LOADING CONDITIONS.

factors in terms of unusual local conditions. Sheltered or shielded locations permit the engineer to use smaller poles than would otherwise be indicated.

The larger companies, recognizing that toll lines are more important from a service standpoint than are rural lines, generally design their toll lines so that toll poles have a greater factor of safety than do the poles used on rural lines.

Pole Line Equations

For those who are interested in the method by which pole line are mathematically designed, the following equations illustrate the usual procedure:

Step No. 1. To compute the bending moment at the ground line of a typical pole in the lead the formula is:

$$M_g = PL + P_1 L_1 + P_2 L_2 + \text{etc.}$$

M_g = bending moment in foot pounds at ground line;
P = pressure in foot pounds acting against the load center (generally the crossarm) of the pole; and
L = length of pole from ground line to load center.

The pressure in foot pounds acting against the load center must be separately computed by the formula P = WNSD. In this formula

N = number of wires on the arm;
S = the length of adjacent span; and
D = diameter in feet of one wire.

"Telephony's" Engineering Data

By B. C. Burden

Index, General.
Sept. 25, 1937.
No. 43-A, page 88.

Pole Circumference, in Inches 6 Feet from Butt	Resistant Moment in Foot Pounds of Northern White Cedar
9.0	693
10.0	950
11.0	1,300
12.0	1,640
13.0	2,090
14.0	2,610
15.0	3,210
16.0	3,890
17.0	4,670
18.0	5,540
19.0	6,520
20.0	7,600
21.0	8,800
22.0	10,100
23.0	11,600
24.0	13,100
25.0	14,900
26.0	16,700
27.0	18,700
28.0	20,900
29.0	23,200
30.0	25,700
31.0	28,300
32.0	31,100

FIG. 85. PORTION OF TABLE SHOWING RESISTANT MOMENT FOR NORTHERN WHITE CEDAR POLES.

W = wind pressure in pounds per square foot (this is 8 pounds in the heavy and medium loading areas, and 12 pounds in the light loading area);

Step No. 2. The *bending moment* in foot pounds computed in step No. 1 may now be compared with a table of *resistant moments* for various commercial size poles, and a pole giving a desired factor of safety selected. For example, if the factor of safety is 1.0, then the resistant moment should equal the computed bending moment.

Tables showing resistant moments for various-size poles can be obtained from any pole company. A portion of a sample table is shown in Fig. 85. It should be noted that on leads carrying more than 10 wires, only two-thirds of the total number of wires are considered due to the shielding effect of adjacent wires. Shielding is not considered in light loading area.

CONSULTING ENGINEER OPENS OWN OFFICE

(*Concluded from page* 31)

the Western Electric Co. as development engineer in inspection equipment. For four years he was a research and development engineer with the Automatic Electric Co., being in charge of a laboratory for the development of a cathode ray television system until 1928. Several basic patents were obtained as a result of that work.

Leaving the Automatic Electric Co., Mr. McCreary became associated with the Grigsby-Grunow Co. in radio laboratory work. Then he was with the Railroad Supply Co. for about three years supervising drafting and development work. He also assisted in the expert work in connection with patent litigation. From 1933 to 1935 when he became chief engineer of the Leich Electric Co., he was chief engineer of the Chicago Television & Research Laboratories.

While with these organizations Mr. McCreary developed a number of inventions which he assigned to them.

With this background of practical experience in research development work and commercial applications of inventions, Mr. McCreary is well qualified to handle specific problems in telephony, railroad signaling, radio, television and electronics.

Commission and Court Activities

(*Continued from page* 28)

with free toll calls into portions of the Associated Telephone Co.'s territory.

Also on January 1, the base rate area in the Roscoe portion of the Burbank Exchange will be greatly extended and will take in nearly all developed areas thus eliminating mileage charges to subscribers outside the present base rate area.

▼ ▼

Anti-Slug Pay Station Law in Washington, D. C.

President Roosevelt has signed a bill making it unlawful to insert slugs in telephone coin boxes in Washington, D. C. This law is expected by the Chesapeake & Potomac Telephone Co. to save it much of the $40,000 it has been losing each year in the District of Columbia from this practice without any chance to prosecute an offender.

Answers to Traffic Questions on Page 24

1. Charges should be determined and quoted immediately following the finish of conversation where charges are requested when the call is filed.
2. A subscriber should not be disconnected under any circumstances.
3. It is not a standard practice to charge non-subscribers for the use of a friend's telephone. Therefore, it is suggested that you refer this question to your manager for solution.
4. In order that circuits may be available to other operators for the transmission of telephone messages.
5. Refer to Information.

The new law provides for a $500 fine or a six-months jail sentence. Officials of the company said it should go far to stop this widespread practice of cheating the company and jamming public telephones.

▼ ▼

Telephone Rates Reduced at Fairfax, Okla.

Following the completion of hearings August 28 in its investigation of telephone rates at Fairfax, Okla., where the Oklahoma Telephone Co. operates, the Oklahoma Corporation Commission reduced charges on business wall and desk telephones from $3.25 to $2.75 per month, on residence telephones from $2 to $1.50 per month, and on single line business telephones from $3.60 to $3.10 per month.

The commission will next consider the demand of city officials at Enid, Okla., for reductions in telephone rates of the Southwestern Bell Telephone Co. Hearings in the Enid case will be followed by investigations of the rates at the Wewoka and Muskogee exchanges of the Bell company where reductions are likewise being sought in petitions filed with the commission.

The Muskogee petition for a rate reduction, filed by Mayor John Reynolds, complained of allegedly excessive charges of the Southwestern Bell. M. J. Holland, district manager of Southwestern Bell, countered with a demand for an increase in telephone rates, declaring that in 1936 "we lacked $54,745 of making what is generally considered a fair return on our investment."

▼ ▼

Instrument Rates of Ohio Independent Companies

The Ohio Public Utilities Commission issued an order September 14 which becomes effective October 1, regulating the differential that may

MAKING IT
Easy and Convenient
TO TELEPHONE

A department store counter as shown above is a convenient and prominent location for a Gray Telephone Pay Station.

This is only one of many possible locations for pay stations. All railway and bus stations, hotel lobbies, drug stores, cigar stores, etc., in your territory are revenue producing locations for a pay station installation.

Write the Gray Telephone Pay Station Company today for assistance in making a survey of your community.

GRAY TELEPHONE PAY STATION CO.
HARTFORD, CONN.

Order Direct or Through
AMERICAN AUTOMATIC ELECTRIC SALES CO., Chicago
GRAYBAR ELECTRIC CO., INC., New York, N. Y.
KELLOGG SWITCHBOARD & SUPPLY CO., Chicago
LEICH SALES CORPORATION, 222 West Adams Street, Chicago, Ill.
STROMBERG - CARLSON TELEPHONE MFG. CO., Rochester
CANADIAN TELEPHONES & SUPPLIES LIMITED, Toronto, Montreal, Winnipeg and Vancouver
NORTHERN ELECTRIC CO., LTD., Halifax, Montreal, Toronto, Winnipeg, Regina, Calgary, Edmonton, Vancouver
Or any other telephone supply house

GRAY TELEPHONE PAY STATIONS

Rates for

ADVERTISEMENTS

in this section

furnished upon request

CABLE—LEAD ENCASED

Kennecott Wire and Cable Company, Subsidiary of Kennecott Copper Corporation, Phillipsdale, R. I.—Paper telephone cable, switchboard cable, bare copper wire. Chicago: 140 South Dearborn Street; Cincinnati: Traction Building; New York: 10 East 40th Street.

CABLE LUBRICANTS

Albany Underground Cable Lubricant adopted by the Bell System for pulling lead sheathed cable.—Inert chemically—Will not separate—Ease where cable removal is necessary—Less strain—Adheres to the sheath. Write for particulars. Adam Cook's Sons, Inc., Linden, N. J.

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

International Creosoting and Construction Co., Galveston, Texas.—Creosoted Southern Yellow Pine Poles. Plants: Beaumont and Texarkana, Texas.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

T. M. Partridge Lumber Co., Minneapolis, Minn.—Northern White—Western Red Cedar Poles. Plain or butt-treated

H. Sigalet & Company, Ltd., Lumby, B. C., Canada—Western Red Cedar Poles. Plain or butt-treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles. Plain or butt-treated.

be charged by Independent telephone companies for the use of desk-set subscriber stations above the wall type instrument, and for the use of handset type station equipment in excess of their respective charges prevailing for desk-set common battery equipment.

The order sets forth that the surcharge shall not exceed the sum of 25 cents per month for a period of two years, provided, however, that where subscribers now using handset type equipment have paid in such surcharges the sum of $6.00 or more, the surcharges shall cease. Those now using such equipment who have paid less than $6.00 shall continue to pay only until such amount has been paid in, after which the prevailing rental for desk-set station equipment shall be the regular charge for handset equipment.

The company recently entered an order for the telephone companies to show cause why this regulation should not become effective, and no protests being filed, the final order was entered.

▼ ▼

Compensation Award Telephone Case Appealed

The Farmers Telephone Association of Hamilton county, Nebraska, has appealed to the courts from a compensation award made by the state compensation court to an operator who claimed that she had acquired a bad case of eczema from using an unclean headset. The girl was paid her salary for six months, but secured an award of $9.18 a week for a total of 300 weeks, the salary payments being credited on the judgment.

▼ ▼

Summary of Commission Rulings and Hearings

Federal Communications Commission Washington, D. C.

September 14: All telephone companies having annual operating revenues over $1,000,000 directed to file, beginning January 1, 1938, monthly reports of selected income and balance sheet items.

October 6: Further hearing before the chief examiner to be held in the offices of the district attorney, post office and court house building, Cleveland, Ohio, to determine whether the Champaign Telephone Co., Urbana, Ohio, comes under the jurisdiction of the commission.

Arkansas Department of Public Utilities

August 31: The Southeast Arkansas Telephone & Power Co. of West Memphis asked for authority to abandon a telephone line from Star City to Cornerville, Ark.

The company in its petition said the line was being operated at a loss and that there were not more than 10 subscribers in Cornerville. The line and subscribers are served through the Star City switchboard which the company operates.

Illinois Commerce Commission

September 21: Hearing in Springfield on proposed advance in rates by the Champaign County Telephone Co. for telephone service in Philo and Tolono, stated in rate schedule I. C. C. No. 2 rendered by the company.

September 24: Hearing in Chicago on the commission's citation, on its own motion, against the Illinois Bell Telephone Co. to show cause why there should not be a reduction in rates for intrastate telephone service rendered by the company in the state of Illinois.

September 24: Hearing in Chicago on proposed change in rates for telephone service stated in I. C. C. No. 1 section 1 original sheet No. 5 general local exchange tariff, telephone service I. C. C. No. 2 original sheet No. 1A, schedule of toll rates I. C. C. No. 2 original sheet No. 1A, rates for special contract service and I. C. C. No. 2 section 1 original sheet No. 6 teletypewriter exchange service tariff of the Illinois Bell Telephone Co.

Maine Public Utilities Commission

September 16: The New England Telephone & Telegraph Co. announced that the extra monthly charge for handset telephones will be discontinued on December 31 in accordance with agreement reached with commission.

Massachusetts Department of Public Utilities

September 16: The New England Telephone & Telegraph Co. announced that the extra monthly charge for handset telephones will be discontinued on December 31 in accordance with agreement reached with commission.

Missouri Public Service Commission

September 13: Application filed by the Huntsville Telephone Co. to issue its $5,000 mortgage note.

New Hampshire Public Service Commission

September 16: The extra monthly charge for handset telephones will be discontinued on December 31 according to an announcement by the New England Telephone & Telegraph Co. following an agreement with the state commission.

New York Public Service Commission

September 17: Reduced telephone rates, effective October 1, filed by the Darien Telephone Co. operating in Darien and Corfu and surrounding rural areas.

North Carolina Utilities Commission

September 3: Petition filed by town councilmen and most of the residents of the town of Troutman asking that present magneto telephone service be replaced with a dial system. They have agreed to a 25 cent per month increase in charges for every class of service except four-party.

Ohio Public Utilities Commission

September 13: Joint application filed by the Polk Rural Telephone Co. to sell all of its property and business to the Star Telephone Co. of Ashland for the sum of $3,000 and the cancellation of $22,712.94 indebtedness for tolls, materials, labor, etc. The property values of the company will be checked by engineers of the commission.

September 13: The Ohio Bell Telephone Co. authorized to file, effective October 1, a new tariff for its Trenton exchange, which by establishing therein the Middletown rates will give all subscribers universal service in Middletown. This action has been taken at the behest of the Trenton subscribers.

September 14: Order issued regulating the differential that may be charged by Independent telephone companies for the use of desk-set stations above the wall type instrument, and for the use of hand-set equipment in excess of their respective charges for desk-set common battery equipment.

September 17: Order issued authorizing the Cincinnati & Suburban Bell Telephone Co. to file an amended schedule effective December 6 providing for furnishing at the existing rates four-party coin-box business service and two-party residence service.

Oklahoma Corporation Commission

August 28: Hearings completed in investigation of rates of the Oklahoma Telephone Co. at Fairfax and an order issued reducing the rates.

Pennsylvania Public Utility Commission

September 9: Ruling issued that any customer of a public utility "who pays a bill, with or without discount, within one month after it is rendered and without contesting the amount," has paid his bill without dispute.

September 27: Hearing scheduled on order to Bell Telephone Co. of Pennsylvania to show why its intrastate rates should not be revised to conform to rates charged by the American Telephone & Telegraph Co. for interstate service over a comparable distance.

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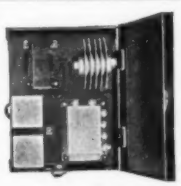

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Vermont Public Service Commission

September 16: Announcement made by the New England Telephone & Telegraph Co., following an agreement with the state commission, that it will discontinue December 31 the extra monthly charge for handset telephones.

Wisconsin Public Service Commission

September 20: Rehearing held in Madison on the commission's recent order denying the Wisconsin Telephone Co.'s plea for permission to increase local rates so as to pass on to subscribers the $501,906 in emergency taxes levied on the company by the 1937 legislature.

September 20: Hearing held in Madison on the commission's orders in the general rate investigation of the Wisconsin Telephone Co., before deciding whether to amend or affirm the orders which have been appealed to the Dane County Circuit Court.

▼ ▼

CENTRAL OFFICE INSTALLATION

(*Concluded from page* 12)

it should be permitted to cool, and all surplus wax allowed to drain off. Sometimes it is desirable to wipe the cable with a clean cloth, after it has partially cooled and drained.

There are times when it is not possible to dip a cable form into a wax pot, due to limited space. In such event a shallow pan or trough can be used and the wax poured over the cable from the pot or with a dipper.

When long cables are to be waxed a metal tube with the bottom closed and with a handle attached to the side, not unlike a mammoth tin cup can be used to advantage. Two different lengths of these tubes are usually necessary on a big job. The beeswax does not heat overly well in these tubes but may be heated in the regular kettle and then poured into them. Any good heavy kettle with a tight fitting cover may be satisfactorily used for heating wax.

The common practice is to heat wax by placing the kettle on an ordinary plumbers furnace of the open flame variety. This is extremely dangerous, to say the least, not to mention that it is noisy and dirty.

We have found that an ordinary, two-heat, electric hot plate is ideal for this purpose and quite safe. The beeswax does not heat as fast as on the plumber's furnace, but this is generally not a serious objection.

There is, however, one precaution which must be observed when heating the cold pot of wax and that is to be sure that the cover is firmly in place. If this is not done, the wax heating slowly from the bottom will expand and finally break through a small opening, squirting a small stream of the hot wax to the ceiling; we know, because it has happened to us.

(*To be continued*)